

# FLIGHT

The  
AIRCRAFT  
ENGINEER  
&  
AIRSHIPS

First Aero Weekly in the World

Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport

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## Flight

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## DIARY OF FORTHCOMING EVENTS.

Club Secretaries and others desirous of announcing the date of important fixtures are invited to send particulars for inclusion in the following list:

Dec. 19 to ...	Paris Aero Show.
Jan. 4, 1920.	
1920	
April 18 to	Seaplane Competition at Monaco
May 2	
June 1 ...	Air Ministry Competition (Small Type Aeroplanes), Martlesham Heath
July, 1920	S.E.A.C. International Aero Exhibition at Olympia
Aug. 1 ...	Air Ministry Competition (Seaplanes) Felixstowe
Sept. 1 ...	Air Ministry Competition (Large Type Aeroplanes), Martlesham Heath

NOTICE. — Owing to Christmas Day and Boxing Day falling on Thursday and Friday, it is necessary that all copy, Editorial and Advertisement, for the issue of December 25 should reach FLIGHT Offices not later than the morning of December 19.

## EDITORIAL COMMENT



GENERAL SEELY'S letter to *The Times*, upon which we commented last week, has been productive of several other letters to the same journal, all setting forth different points of view of the relation of air power to sea and land power. General Guy Dawnay writes a very closely-reasoned communication, in which he seems to advocate a return to the old system of two separate Air Services, attached respectively to the Navy and the Army. Nor does he do this in the usual dogmatic manner of the crusted old Service officer who, as a rule, seems to argue from the point of view that what existed in the time of the Crimean War must of necessity be good now, and that the customs and organisation of the Services should be as unalterable as the laws of the Medes and Persians. On the contrary, he presents the case as he sees it, and were it not for the obvious failure to see quite far enough, he would be almost convincing.

He lays it down that in considering the question there are two vital points to be taken into consideration: the absolute necessity for co-ordination and a common doctrine in essentials; and the equally vital necessity for providing the Navy and Army with efficient organs of their own. On the first point, he proceeds, three things at least may be said. Only by the fullest possible co-ordination will it be possible to fit the Air Force into its proper place in the military (which includes the naval and aerial) machine. Further, to each arm its own tactics; but it is a main essential that air forces working with the Navy or Army should be thoroughly familiar with, should have most detailed knowledge and understanding of, military and naval tactics respectively. Moreover, as strategy is all one, there must be no risk of an independent Air Service devising divergent or unrelated theories in the region of strategy, or even in the borderland of "grand tactics." These desiderata cannot be ensured without either a combined Ministry of Defence or a Joint General Staff; nor without a most comprehensive scheme of attachment of Air Force *personnel* for thorough training with the older Services.

We agree with all of this, but it is here we think,

with all submission, that General Dawnay fails in vision. We would answer the argument by taking the proposition that strategy is all one, and saying that there must be no risk of an independent sea or land service devising "unrelated theories," inasmuch as it is admitted by every authority that air power must in the next great war exert a decisive effect on the course of campaigns. Unquestionably, however the whole subject is regarded, the case is most amply made out for either a Ministry of Defence or a Joint General Staff. Of the two, we should prefer the latter, as being very much less cumbrous and less likely to be subject to delays in decision. In the matter of the attachment of Air Force *personnel* for training with the older Services, there can be no question but that the idea is thoroughly sound, but we should carry the matter farther, and lay it down as fundamentally sound that there should be an all-round exchange of *personnel* in order that each of the three great Services might thoroughly and properly understand the powers and the limitations of each other, and thus be in full possession of the details of the rôle and duties which each is competent to carry out in combined operations or in the realms of grand strategy. The whole thing seems to hinge on the fact that all war is a question of related effort, and it is only afterwards that the historian is able to dissect the parts played by each Service and by each arm of the several Services. At the present moment it is difficult for officers brought up in the old school to thoroughly realise that air power has become as potent a factor as sea or land power and that it in reality requires a new and separate train of thought.

#### The Weakness of the Case

General Dawnay goes on to speak of the provision for the Navy and Army of "efficient organs of their own." He thinks that the outlook for the Army—he declines to speak for the Navy—is at least dubious. He makes the point that as cavalry used to be called the eyes of an army, aircraft may now be so called. But if aircraft are the eyes of the Army, the Army has no eyes of its own. Yet in modern war eyes of its own are more than ever necessary; it is no longer mainly a matter of strategic or tactical reconnaissance, for modern artillery requires eyes of distant vision incessantly. It seems to us the answer is that the British armies in France and in the more distant theatres of the late War were never so well or efficiently served in the matter of "eyes" as they were after the creation of the Air Force as a separate Service. To say that because the Air Force is the Air Force and not a unit of the Army the latter is without eyes of its own is most certainly an error of vision. Is there any reason to think that the Air Force will be any less capable of acting as the eyes of the Army in a future war than it was in 1918? Obviously, the answer is in the negative and it weakens the case which General Dawnay tries to make out but he should fall into so manifest a misjudgment of probabilities.

He next expresses grave doubt whether in ten years' time the young Air Force officers will know enough about warfare on sea and land to undertake efficiently reconnaissance for the Army or Navy. Nor does he seem to think that in that time they will know enough about artillery on sea or land to co-operate to the fullest advantage with that arm. He thinks

that ten years' complete independence without some exceedingly strong co-ordinating factor might easily produce a dangerous loss of efficiency in co-operation. He says: "No one who saw the working of the Dardanelles Expedition from within can disguise from himself that, in spite of the most loyal, admirable, and unbroken harmony between the Navy and Army in that instance, considerable obstacles are placed in the way of perfect co-operation between two Services when mutual understanding of the tactical views and requirements of each is not complete throughout, when the staff systems of the two are utterly different, and when the heads of either may report independently to independent Ministries at home."

It is possible to agree to all this and yet to fail to see in it any case for again fusing the Air Service with the older Services, any more than there is for the fusion of the Army and Navy in order to arrive at that perfect mutual understanding without which there cannot be efficient co-operation in war. What does seem to emerge is that the case is fully proved for the constitution of a Great General Staff which should make war its sole study. Not war by land. Not war by sea. Nor war in the air. But war as one single subject and in all its relations. It should as one of its first tasks properly visualise the functions, as well as the limitations, of all the Services and strive to arrive at a comprehensive and far-reaching system of real co-operation between them. It should bring into line the staff methods of all three so that never again will it be possible to see in war promising operations hampered and brought to nothing because of a want of essential understanding between Services due to nothing but difference in method. The trouble has been in the past that each Service has to a very great extent lived in a water-tight compartment of its own. The soldier has not troubled to study sea war and its relation to war on land, nor has the sailor concerned himself particularly with the strategy of land war. Above all, they have both cultivated the habit of regarding war as a matter of sea and land alone. They have yet to realise that a new power has arisen in an element which has until quite recently been completely disregarded. They have now to readjust the focus of thought and they are not finding it easy to do so.

#### The Douglas-Pennant Enquiry

The Select Committee of the House of Lords, appointed to enquire into the charges brought by Miss Douglas-Pennant in connection with the administration of the W.R.A.F., has at last made its report. As was obvious from following the evidence, the Committee finds that none of the charges has been justified and the Report is from beginning to end a scathing censure of Miss Douglas-Pennant, whom the Committee accuses of listening to scandal and bringing loose charges against a number of people who were perfectly guiltless of wrong-doing. The story of an intrigue to get rid of Miss Douglas-Pennant, the Committee scouts as being unworthy of credence and finds that everyone connected with her supersession in the command of the W.R.A.F. acted in the most perfect good faith. And so ends one of the most unsavoury episodes of the War. No good can come of the discussion now of any single aspect of the case and the best thing to be done is to bury the whole thing



## Flight—And the Men



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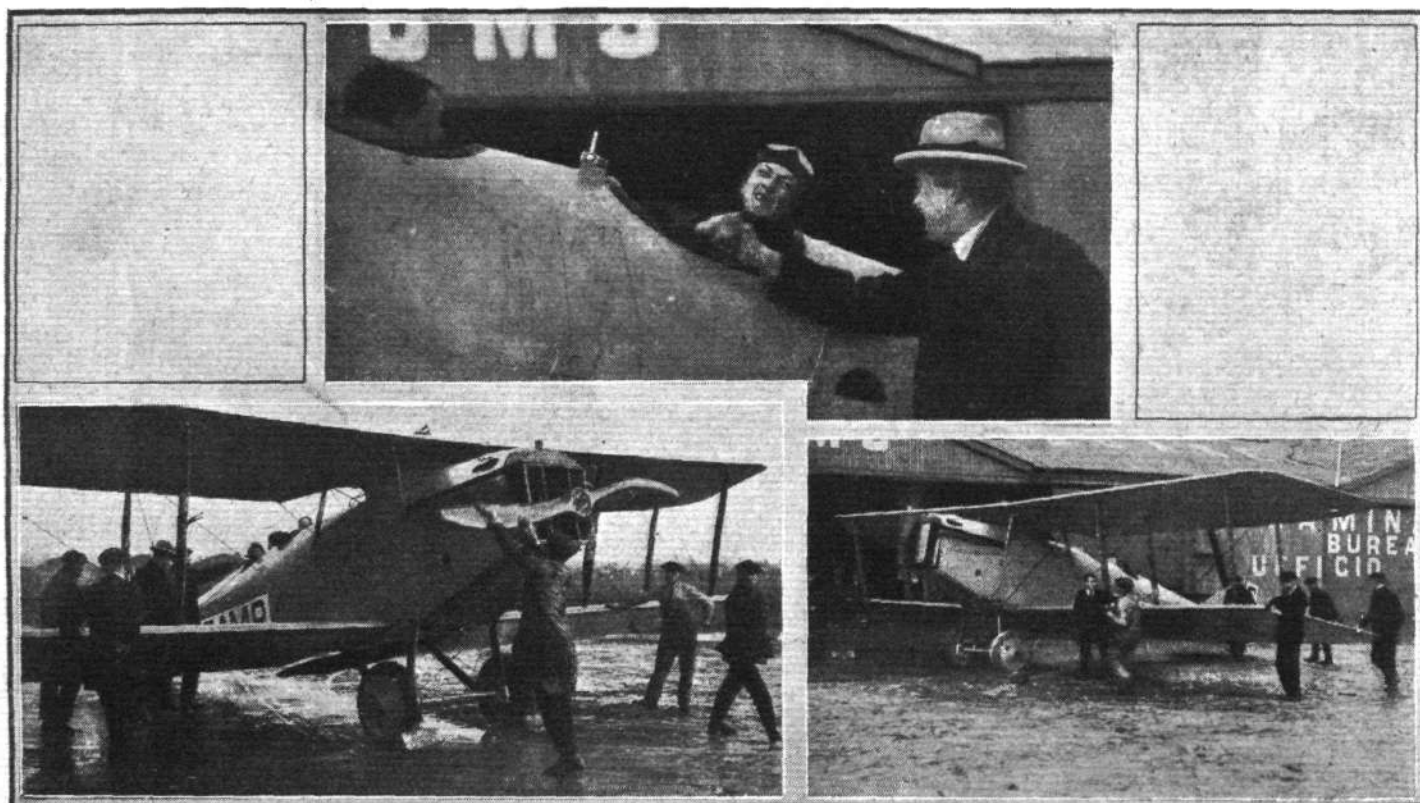
H. P. FOLLAND, A.F.R.Ae.S., Chief Engineer and Designer, Messrs. The Nieuport and General Aircraft Co., Ltd.

in oblivion, if that be possible. So much mud has been thrown that it is impossible none of it should stick and we fear that more than one party to the case will have cause for remembrance and regret for many years to come.

The Committee deplores that the enquiry was ever granted. It "sincerely trusts that this enquiry will not form a precedent for an enquiry being ever granted hereafter under similar circumstances. . . . It is necessary that those who are employed in the public service shall be removable from the service if the Minister, in the honest exercise of his discretion, thinks they ought to be removed. In such a matter the wounded pride of the officer removed must be allowed no place." That is all very well in its way and had there been no circumstances such as gave the idea to Miss Douglas-Pennant that there was an intrigue against her there need not, and would not, have been an enquiry at all. For this the Committee think Lord Weir was to blame. The Report itself says that "supersession *brevi manu* on August 28, when a month had been given on August 17, was an unfortunate error on the part of Lord Weir. No wonder the lady was startled. . . . The Committee think it clear the change of front was due solely to Sir Auckland Geddes' letter of August 19 (a letter in which Sir Auckland said the arrangements for the W.R.A.F. were thoroughly bad, and unless put right the women's recruiting movement would be jeopardised). Lord Weir was vacillating. He does not seem to have known his own mind in the matter until he was brought up short by the plain intimation from Sir Auckland Geddes, then Minister of National Service, that the existing state of things must not continue. . . . The circumstances, the Committee think, might well account for a feeling of indignation and resentment in Miss Pennant, which resulted in

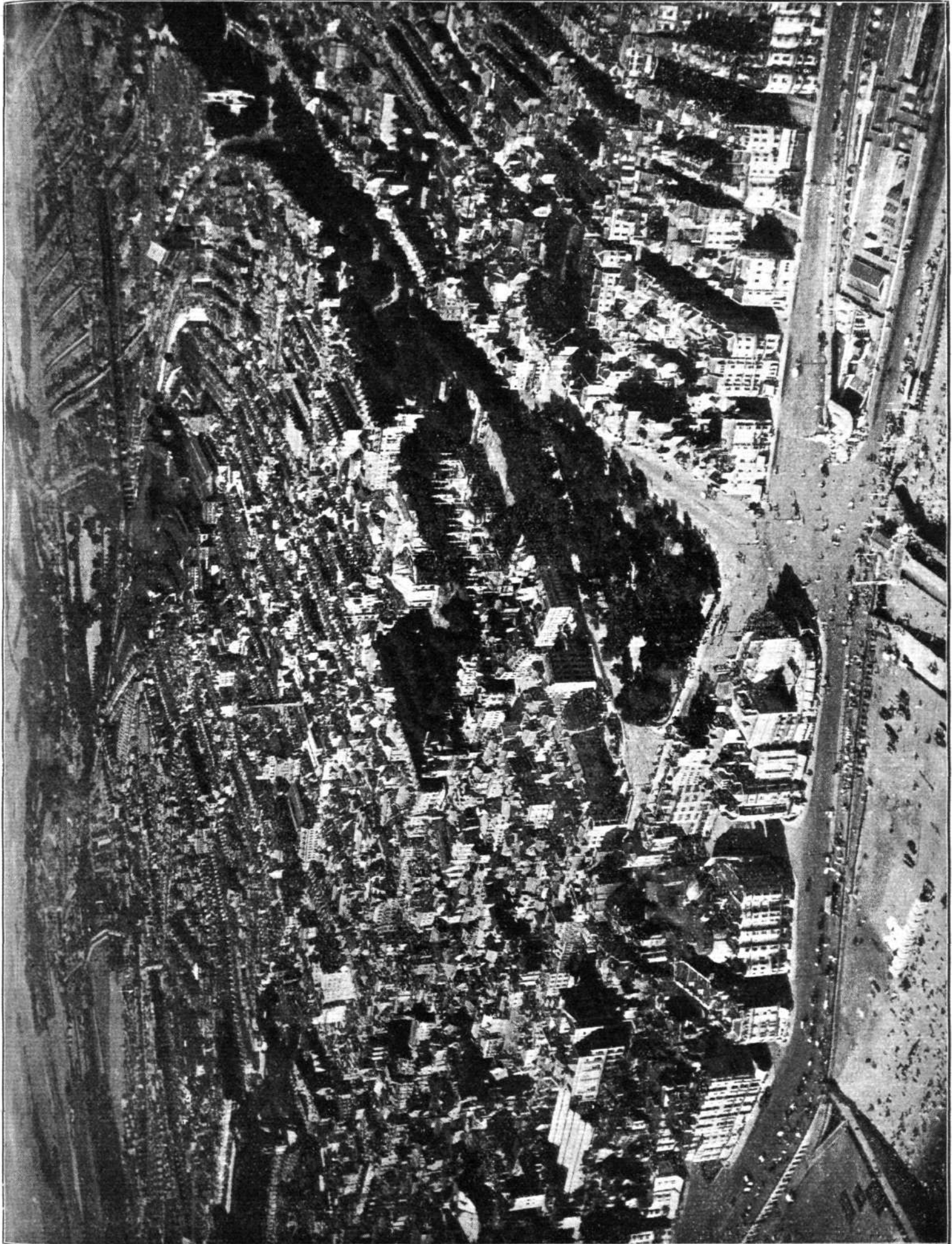
her pressing for an enquiry when under other circumstances she would not perhaps have done so."

Therein no doubt lay the chief mischief. This journal was among those which insisted that an enquiry was the right of anyone placed as Miss Pennant was situated at the time, and in spite of all the deplorable innuendo and the loose statements which have been made before and during the enquiry, we still think that such an enquiry was inevitable in all the circumstances. We do not propose to review the whole of the painful circumstances again. There is no need, nor would the task be one to our taste in any case, although in totally other directions we have had occasion to point out flagrant cases of abuse which upon enquiry have been rectified. But we do think it transpires that the error of a vacillating Minister placed Miss Pennant in such a position that she was almost compelled to press for the enquiry, which we doubt not she regrets she ever asked for now that the Committee's Report has been made. That lady must accept all the blame and odium that must attach to her for the manner in which she, without going over-deeply into the alleged position, made the grossest charges against individuals who have been entirely acquitted by the Committee, but it is the simplest justice to her to point out that the manner of her dismissal was such as to lay her under a stigma which she believed she could only clear by means of public enquiry. Not only will she have learnt a severe lesson from the result, but it is to be hoped that Lord Weir or any other Minister who may find himself in the dilemma in which he was in August, 1917, will appreciate the infinite harm that can be worked by the failure of the head of a great public Service to know his own mind for more than a week at a time.



THE AUSTRALIAN FLIGHT : On the left, the start from Hounslow of the Martinsyde 'plane on December 4. "Goodbye-ee!" At top : Mr. Nesbit of the Martinsyde firm wishes good luck to Capt. C. E. Howell on his journey. On the right : The Martinsyde 'plane gets away at 9.35 a.m.





"Flight" Copyright.

A view of Brighton as seen from an Avro seaplane

# THE FLIGHT TO AUSTRALIA

Just as this issue of FLIGHT goes to Press comes the expected news of the safe arrival at Port Darwin in Australia on Wednesday last of the Vickers-Vimy-Rolls, piloted by Captain Ross-Smith—and the winning of the £10,000 prize offered by the Australian Government. As a matter of fact the time limit for the flight, 720 consecutive hours, allowing for the difference in time, expired on the morning of to-morrow (Friday), so the Vickers is well inside the period set. Owing to the delay in the transmission of long-distance messages we were only able to record in our last issue the arrival of the machine at Allahabad and its departure for Calcutta on November 28. Continuing his steady progress, Capt. Ross-Smith arrived at Akyab at 2 p.m. on November 29, and at Rangoon (Burma) at midday on the 30th, three-quarters of an hour before Poulet, on his twin-engined Rhone-Caudron, arrived. The latter had flown from Calcutta to Akyab on November 28. The two pilots arranged to fly in company to Bangkok, but Poulet was first away on December 1, and so was enabled to reach the destination first; Captain Ross-Smith, however, landed at 1 p.m. The greatest assistance was given to the aviators by Prince Pitsanuloke and the Siamese Aviation Corps.

On December 2, the Vickers-Vimy-Rolls left Bangkok at 7 a.m., and arrived at Singora at 1 p.m., being escorted during the first 50 miles by four Siamese machines. After the first

the Australian Defence Department had arranged for the Royal Australian Navy, when warned by competitors, to maintain a patrol between these points.

## The Other Competitors

There are now three other machines on the way to Australia. On December 4, Captain C. E. Howell, D.S.O., M.C., D.S.C., accompanied by Mr. Henry Fraser, left Hounslow at 9.34 a.m. on his Martinsyde, fitted with 275 h.p. Royce engine. Previous to starting he receiving the following:—

From Prince Albert: "May you have good fortune in your sporting journey."

From Mr. Winston Churchill: "I wish you the best of fortune in your sporting attempt."

From Maj.-Gen. Sir F. H. Sykes, Controller-General of Civil Aviation: "Every best wish to you in your venture."

The machine arrived safely at Lyons, and on December 5 reached Pisa at 4 p.m. Padua was reached on December 6, and then bad weather entailed a day's delay, but the machine went on to Taranto on December 8.

The Blackburn Kangaroo, which started from Hounslow on November 21, and was reported at Rome on November 29, was at Taranto at 2 p.m., on December 3, and arrived at Suda Bay. She left on December 8 for Egypt, but when 40 miles from land an oil pipe on the port engine broke, necessitating a return to Suda Bay.



Sketch Map of the England-Australia Flight

two hours' flying, the machine had to negotiate a heavy monsoon, but got through safely, although it was found impossible to make the petrol last out until Singapore could be reached. Poulet, who left Bangkok two hours later, was also caught in the storm, and was blown back to Rangoon, 350 miles behind his starting point.

In landing, the tail-skid of the Vickers-Vimy-Rolls was broken, but this was repaired next day. During the night the weather was squally, and Captain Ross-Smith and his crew had an exciting time holding down the machine.

Petrol arrived during the evening of December 3, but it was then raining too hard to put it into the tanks. However the next day—being the pilot's birthday—it was determined to make an effort to reach Singapore and this flight was made through the rain. He arrived at Kalidjatti, near Bandoeng, West Java, at 4 p.m., on December 6. A brief message stated that Captain Ross-Smith was passing through Biwa (Island of Soembawa) on the night of December 8, and that he was expected to be in Australia on Wednesday.

In order to minimise the risk to competitors while flying over the sea from the Island of Timor to Port Darwin,

The flight was successfully accomplished on the starboard engine alone, and a safe landing effected. The machine itself was undamaged.

This flight followed on a successful flight of 627 miles from Taranto to Suda Bay on a land machine.

The prize was won by Capt. Ross-Smith when he landed at Port Darwin, but the Australian authorities have organised an overland route to Melbourne, with 11 stages in the 2,396 miles. The suggested stages and distances from Port Darwin in the journey are: Katherine (170 m.), Newcastle Waters (405 m.), Anthony Lagoon (530 m.), Avon Downs (730 m.), all in the north territory; Cloncurry (915 m.), Longreach (1,230 m.), Charleville (1,473 m.), in Queensland; Bourke (1,728 m.), Narromine (1,936 m.), Cootamundra (2,111 m.), in New South Wales; Melbourne (2,396 m.), Victoria.

The crew of the Vickers-Vimy-Rolls consists of Capt. Ross Smith, M.C., D.F.C., pilot, Lieut. K. M. Smith, assistant-pilot, Sergt. W. H. Shiers, A.F.M., and Sergt. J. M. Bennett, M.S.M., A.F.M. The machine, of which a description, with photographs and scale-drawings, appeared in FLIGHT of Nov. 6 last, is fitted with two 350 h.p. Rolls-Royce engines.



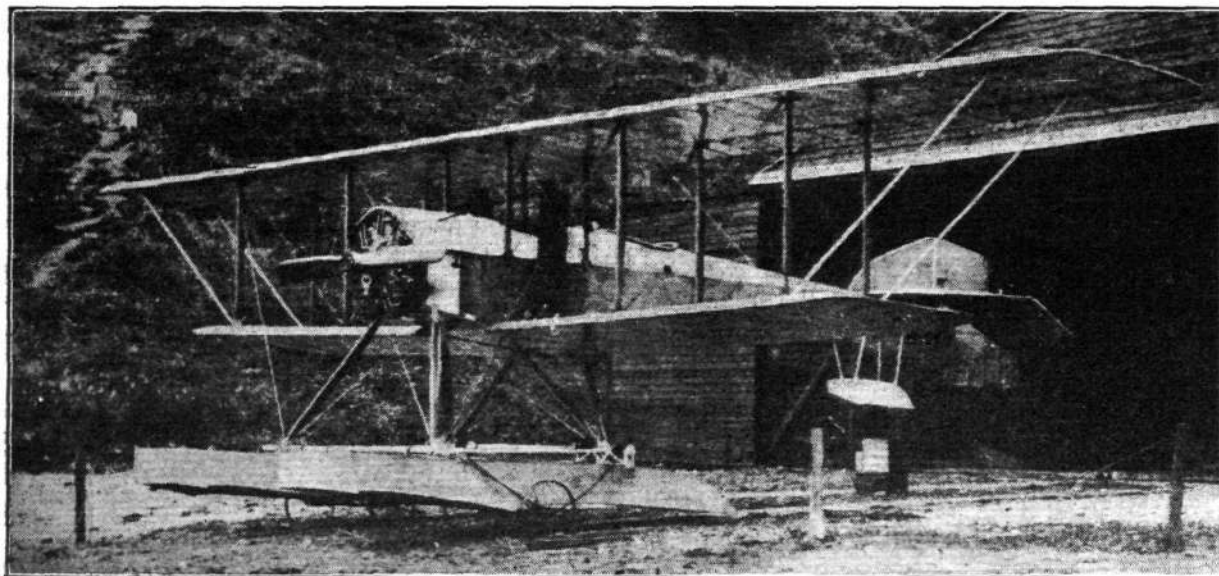
## "MILESTONES"

THE BLACKBURN MACHINES. \*

LIKE one or two other firms that date back to the beginning of aviation in this country, the Blackburn Aeroplane and Motor Co., Ltd., of Leeds, as the firm is now styled, commenced their career as constructors of aeroplanes of the monoplane type. These machines had, at first, some resemblance to the famous French Antoinette monoplanes, with their tapered, square-ended wings set at a large dihedral angle, and with triangular-shaped rudders above and below the level of the elevators. They differed considerably from the Antoinette machines in many respects, however, not only in the matter of power plant, which was in those early days either Gnômes or Isaacson radials, whereas the Antoinette had Antoinette water-cooled engines, but also in the wing bracing. The characteristic feature of the Antoinette monoplanes was, it may be remembered, the king post type of bracing. The Blackburn monoplanes had the usual monoplane bracing, and also its undercarriage was of totally different design, being of what was known in those days as the Farman

"cleaned up," improving not only the appearance of the machine but also its aerodynamic qualities. At the Olympia Aero Show of 1914 was exhibited the most modern version of the Blackburn monoplane, which was thought a great deal of in those days, and in which the Antoinette influence was rapidly disappearing, the only feature in common being the comparatively large size (for monoplanes) of both machines.

During the same year, 1914, the first Blackburn biplane made its appearance. This machine was a seaplane designed for the *Daily Mail* "Circuit of Britain," which was postponed owing to the outbreak of War. In a general way it resembled the Blackburn monoplanes, but instead of the triangular section body which had characterised the monoplanes, the seaplane had a rectangular section fuselage. As the race was called off, the biplane-seaplane, which was to have been piloted by Mr. Sydney Pickles, did not have an opportunity of showing its capabilities in peaceful competition,



The Blackburn Type "L" seaplane, 130 h.p. Salmson engine

type—that is to say, a wheel and skid combination. The body was of triangular section throughout, braced by wood members instead of wires. Perhaps the most original detail of those early machines was the controls, which were in the form of a wheel mounted on a horizontal longitudinal shaft, which was secured at its forward end by a universal joint. Rotation of the wheel operated the wing warping, an up-and-down motion actuated the elevators, while the rudder was worked by shifting the wheel bodily in a sideways direction. The feet thus took no part whatever in the control of the machine.

As time went on and aeroplane controls commenced to become more standardised, this unique form of controls was discarded in favour of one of more orthodox design. Also, the machines generally were

\* Previous instalments in this series appeared as follows: *Airco* (de H.), January 9, 1919; *Bristol*, January 23, 1919; *Sopwith*, February 6, 1919; *Avro*, March 20, 1919; *Armstrong-Whitworth*, April 3, 1919; *Vickers*, June 12, 1919. All the scale diagrams of this series are to a uniform scale, and are thus immediately comparable as regards relative size.

but quite early in the War she was modified to carry a machine gun, and hence became known as

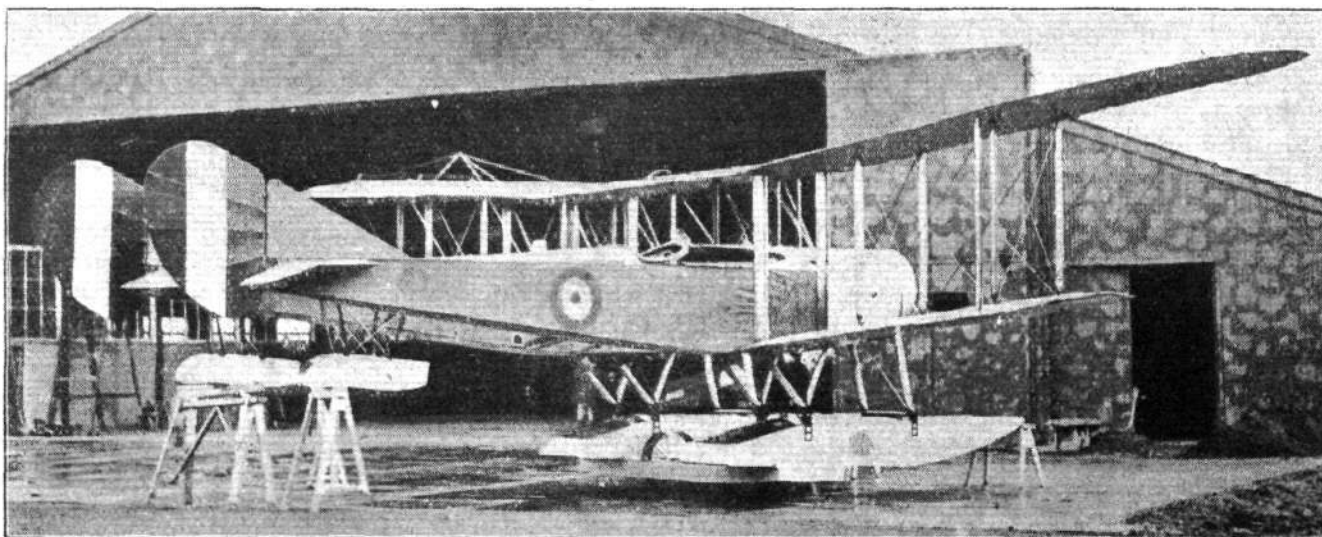
### The "Type L" Seaplane. (September, 1914)

This machine was fitted with a Salmson Canton-Unné engine of the water-cooled radial type, the radiators being mounted on the sides of the fuselage. Considering the power loading (over 19 lbs./h.p.), the performance was quite good, and the flight range (445 miles) was rather out of the usual for those days.

The next machine to be designed and tested was of very unusual design, and was produced as a result of instructions from the Admiralty to design a twin-engined machine for dropping darts. In those days the dart was considered quite a weapon, and certainly the number that could have been carried on a large twin-engine machine should have been sufficient to cause unpleasant punctures in the Hun.

### The "Type T.B." Seaplane. (August, 1915)

as this machine was called, represented a very drastic departure from usual practice. Instead of having a central fuselage, and the engines placed in nacelles on the wings, the T.B. had two fuselages, each with



**The Blackburn Type "T.B." seaplane, two 110 h.p. Clerget engines**

its engine and pilot. The *fuselages* were connected at their forward end by the main biplane structure and at the rear by the tail. As the machine was of the seaplane type, each *fuselage* had under its forward end a plain non-stepped float and a smaller tail float under its stern. In spite of the twin *fuselage* arrangement, which is not usually conducive to beauty of outline, the T.B. was, as will be seen from the accompanying illustrations, by no means an ugly machine, and her performance was very good, both as regards speed and climb. In fact, we understand that as regards the latter she established a record for altitude.

The first experimental machine was fitted with two 100 h.p. Gnome monosoupape engines, but these were replaced, in the production machines, by two 110 h.p. Clergets.

**The Triplane Scout.** (December, 1915)

In appearance one of the most extraordinary aeroplanes ever built was a little Blackburn triplane produced in 1915. At that time the synchronised machine gun had not been generally adopted, and consequently there was a demand for machines in which the pilot was free to fire in a forward direction. The D.H.2, for instance, was a reply to this demand, and the Blackburn triplane was designed with a similar purpose in view. The machine was provided

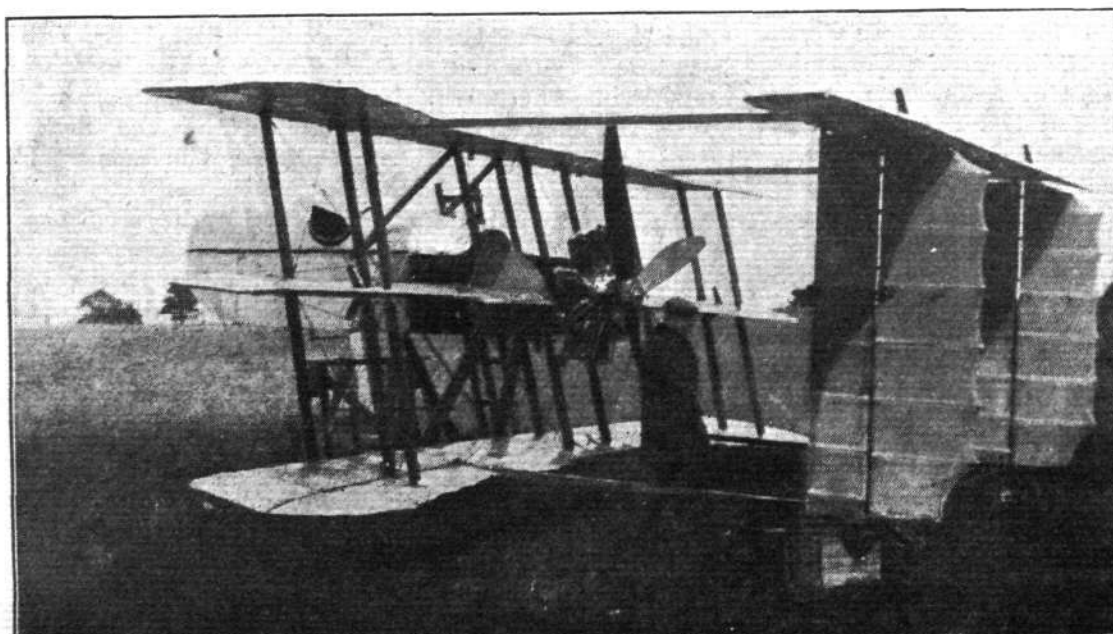
with a machine gun firing forward through the nose of the *nacelle*, and consequently gave the pilot a very free field. In a rearward direction also the view was quite good, the middle plane being on a level only slightly lower than that of the pilot's eyes.

The engine fitted was a rotary 100 h.p. Gnome or 110 h.p. Clerget, both being tried. Considering that the machine was a pusher, which type is not usually as fast as the tractor type of machine of the same power, the performance of the Blackburn was quite good, the maximum speed being 115 m.p.h. With the invention of the synchronising gear for machine guns the *raison d'être* for the pusher type disappeared and the construction was discontinued.

**The "G.P." Seaplane, or "Kangaroo" Seaplane.**

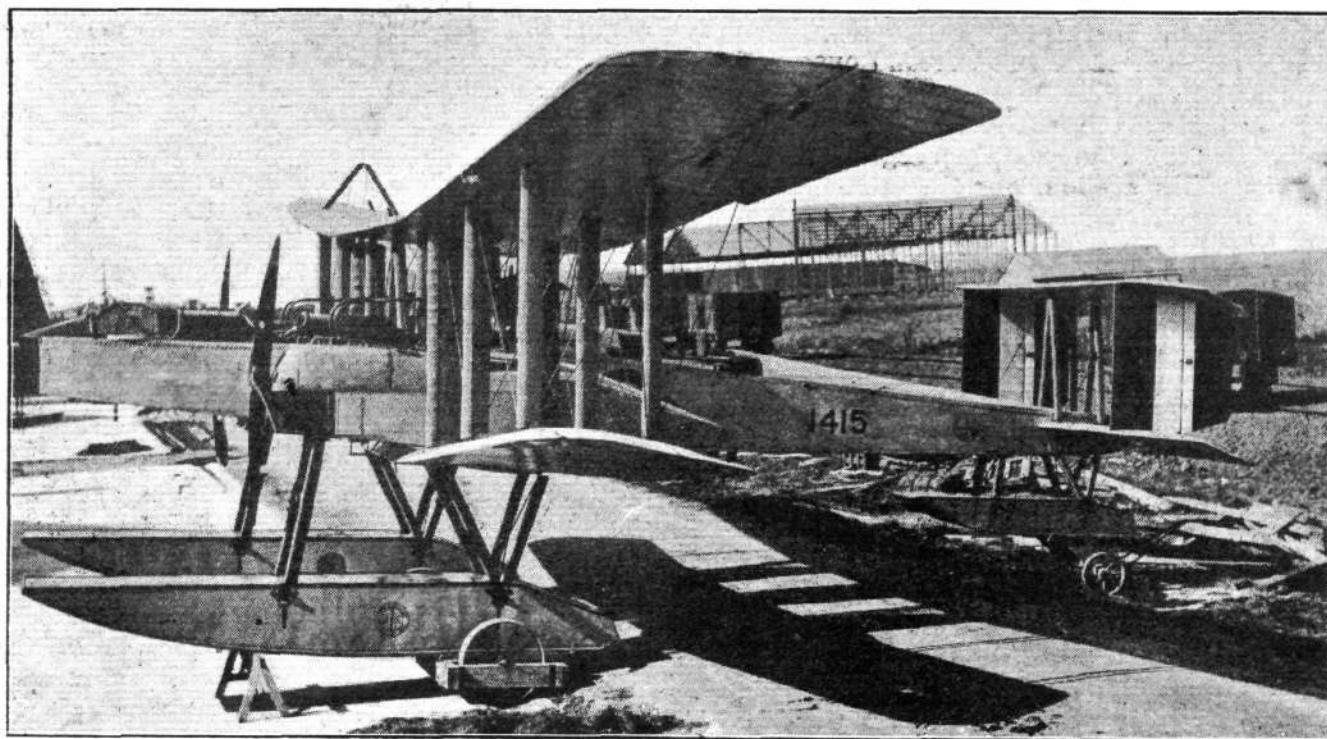
(July, 1916)

Probably the best known of all the Blackburn machines is the "Kangaroo" land machine, and it is not generally known that the prototype of this machine was a seaplane. This is, however, the case, the machine which led to the production later of the famous "Kangaroo" being a seaplane with two engines placed on the wings, and otherwise being, generally speaking, similar to the land machine that was to follow. This machine was known as the "G.P." (general purpose) seaplane, and the



**The Blackburn triplane scout, 100 h.p. Gnome Monosoupape**

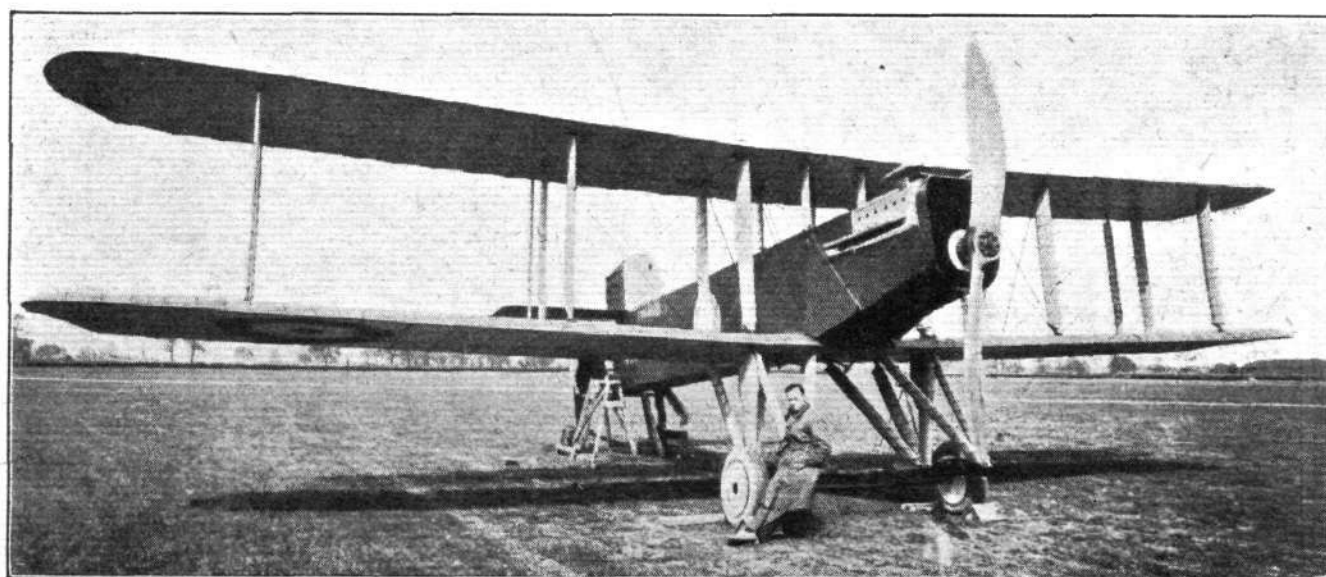




The Blackburn "G.P." seaplane, two Rolls-Royce engines



The Blackburn "Kangaroo," two Rolls-Royce engines



The Blackburn "Blackburd," Rolls-Royce engine

first made its appearance in July, 1916. The experimental machine was fitted with two Sunbeam engines of 160 h.p. each. The second experimental machine had two Rolls-Royce engines of 190 h.p. each, and finally the production machines were fitted with two Rolls-Royce Falcon engines of 250 h.p. each. There was a plain, non-stepped float underneath each engine, and a single tail float under the stern of the fuselage. The crew consisted of three men, the pilot being placed about halfway between the leading edge of the planes and the nose of the fuselage. In front of him was a gunner armed with a machine gun on a gun ring, and farther aft in the body was another gunner whose duty it was to defend the machine against attacks from behind. In addition to the guns and their ammunition, the G.P. seaplane was designed to carry bombs, or even a torpedo, so that it was well armed for either offensive or defensive purposes.

**The "Kangaroo" Bombing Aeroplane.**

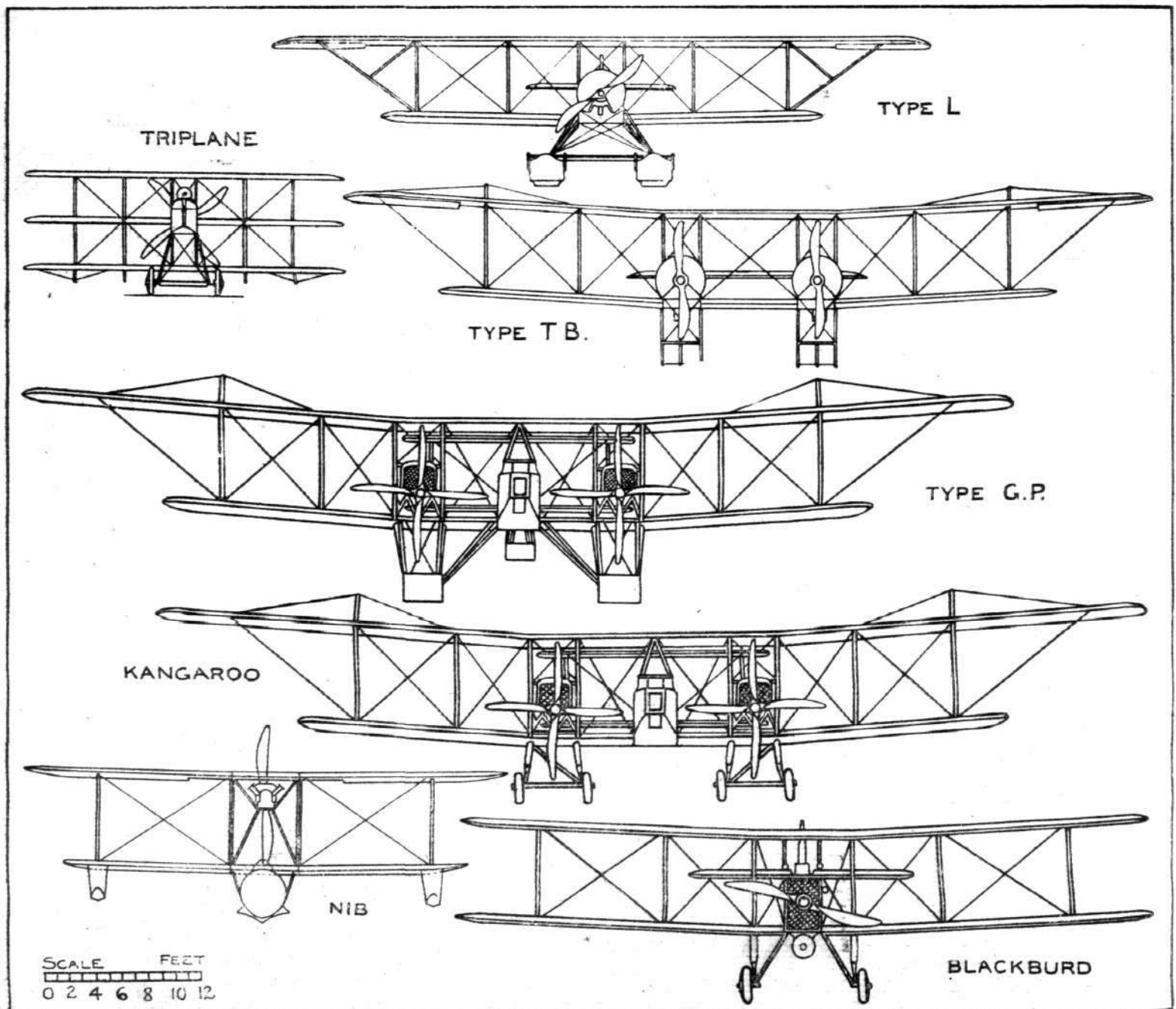
As a direct result of the successful trials of the G.P. seaplane, the Blackburn firm received instructions to convert her into a land machine. By replacing

the float undercarriage with two Vees under each engine this was very easily done. In her new form the "Kangaroo" was suitable for night bombing raids, and also, in spite of being now a land machine, for anti-submarine patrol, in which latter capacity she did very valuable work, accounting, we believe, for more than one Hun submarine. The standard "Kangaroo" carries a crew of three, a front gunner who has control of the bomb gear, a pilot, and a rear gunner who also acts as wireless operator. The engines fitted are Rolls-Royce Falcons.

Since the Armistice the "Kangaroo" has done excellent work as a passenger carrier, notably at the E.L.T.A. Exhibition at Amsterdam, while another machine of the same type is now on its way to Australia in connection with the Australian Government's prize of £10,000. As will be seen from the accompanying table, the performance of the "Kangaroo" is very good for the power loading (17 lbs./h.p.).

**The "Nib" Flying Boat**

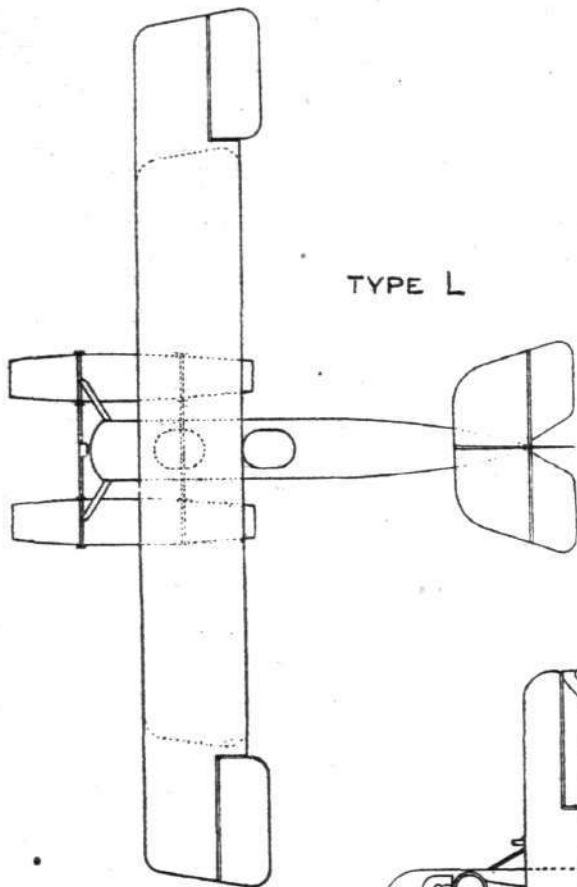
The next machine to be laid down was a seaplane of the flying boat type, known as the "Nib." Owing to certain changes in Service requirements this



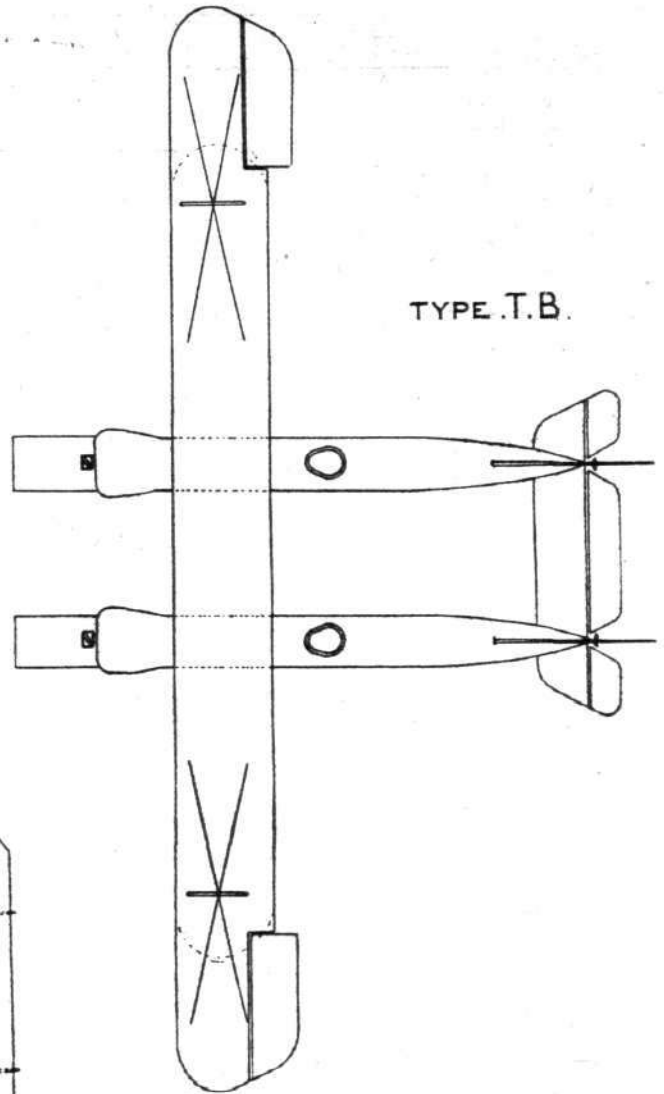
Front elevations of the Blackburn machines



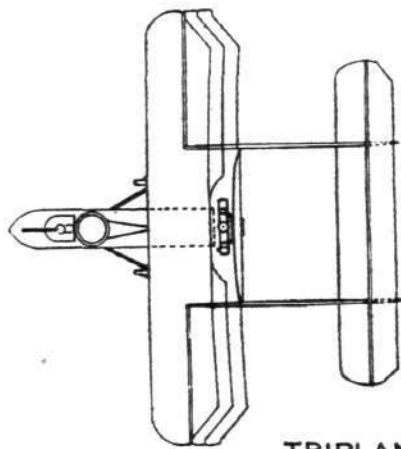




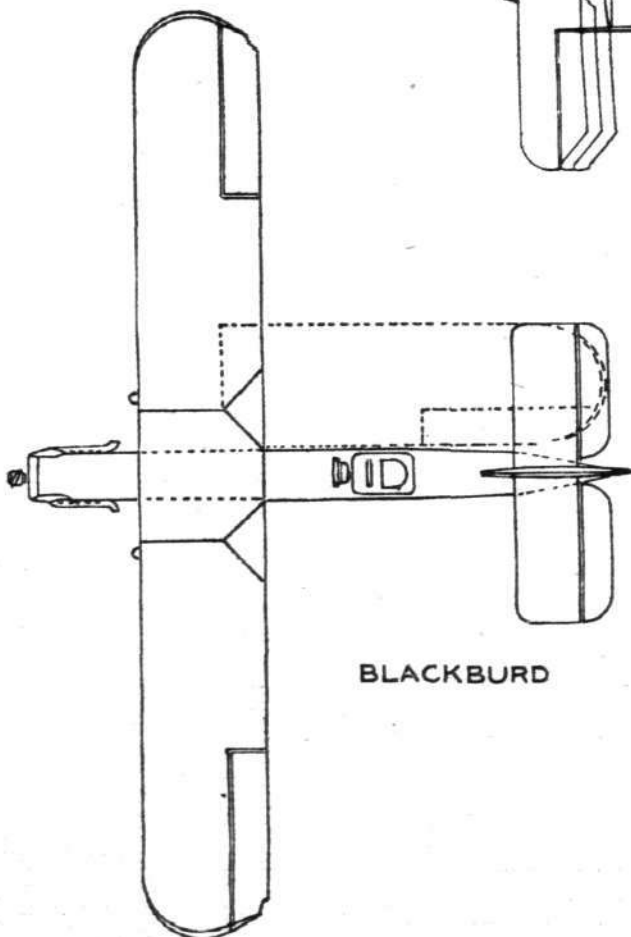
TYPE L



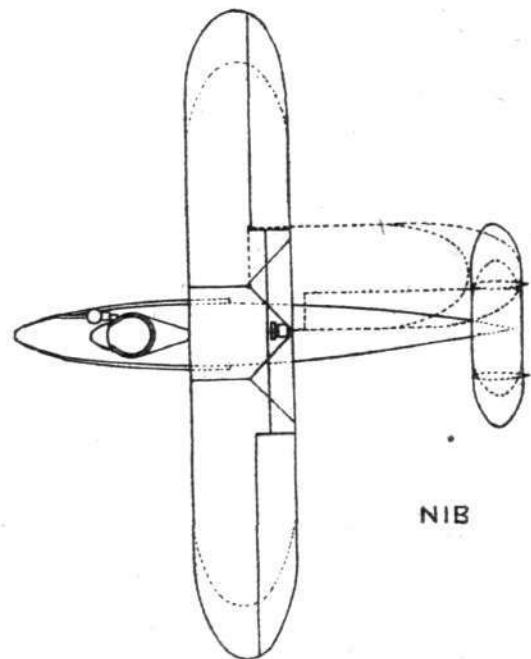
TYPE T.B.



TRIPLANE



BLACKBURD



NIB

SCALE FEET  
0 2 4 6 8 10 12

Plan views of Blackburn machines

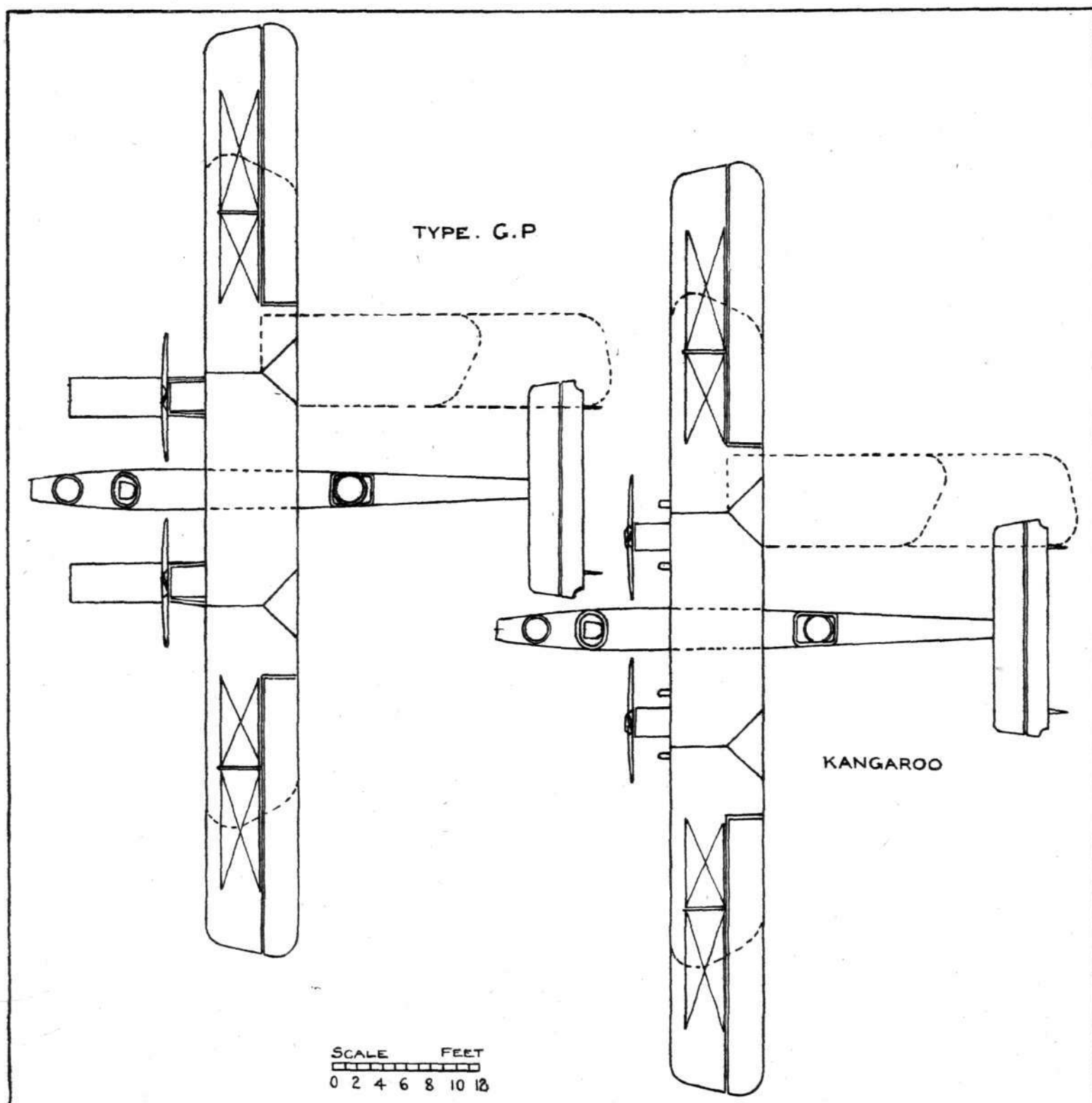


machine was not actually completed, although we understand that both design and construction were nearly finished. It will therefore be understood that the figures of performance, etc., are estimated ones. The "Nib" was intended to act as escort to our large bombing flying boats.

#### The "Blackburd" Torpedo Plane.

This machine, it will be seen, is of rather unusual appearance, resulting from the special requirements for which she was designed. As the title indicates, the chief function of the "Blackburd" is that of dropping torpedoes, and, consequently, the lifting capacity of the machine has to be considerable, as the torpedo weighs over half a ton. Also, she is designed for use from a "mother" ship, and hence

is of small dimensions when folded. The use from a ship entails starting from the deck and alighting, on the deck or on the sea as circumstances dictate. To this end the "Blackburd" has a special undercarriage, the wheels of which can be dropped after rising, leaving clear two long skids which can be used for landing on the deck after the torpedo has been discharged. If, on the other hand, it becomes necessary to alight on the sea, the skids do not, we understand, have the same "tripping effect" as do wheels, and there is therefore less danger of the machine turning over on her nose. When in the water the machine is kept afloat by inflating air bags in the *fuselage*, which gives the necessary flotation to support the machine until she is "collected" by her mother ship.



Plan views of Blackburn machines

# IMPERIAL AIR ROUTES

THE following report of the Advisory Committee on Civil Aviation to the Right Hon. Winston S. Churchill, M.P., Secretary of State for Air, on Imperial Air Routes, was issued as a White Paper on Wednesday. Although the report comes somewhat late in the day, it is an informative document, and if all Government Committees exhibited the same assiduity in seeking information and lucidity in reporting, we think there would be a decided change in public opinion as to the usefulness of such bodies:—

The Committee have given very careful consideration to the question, "How best to organise Imperial Air Routes," which was the question specifically referred to them for consideration and advice when they were appointed. The Committee understand the designation "Imperial Air Routes" to mean routes which will enable the new transport element, namely, the air, to be made use of in speeding up communication between the various portions of the British Empire. This Report throughout deals only with heavier-than-air machines. The Committee propose to submit a further report dealing with the subject of the possible use of lighter-than-air craft in the development of Imperial Air Routes.

They have considered Canada, Newfoundland, South Africa, India, Australia and New Zealand as the main outlying portions of the British Empire (and to these they would add Egypt) to which they should direct their attention, and have thought it best to confine themselves to the question of the establishment of main trunk lines connecting these portions of the Empire with the United Kingdom by air. Such trunk lines would no doubt in course of time be supplemented, if not preceded, by local lines connecting up the various Dominions and Colonies internally, and with other Dominions and Colonies, but this portion of the problem is one which the Committee do not conceive themselves to be called upon to deal except on specific reference by the Secretary of State.

They offer the following observations on the problem of main trunk lines. At the outset they wish to make it very clear that they have in their investigation kept always in view the present financial position of the country. That position obviously dictates the restriction of proposals to what is necessary to meet the essential needs of the present situation.

Under existing conditions it is not practicable at the moment to recommend any large appropriation of public funds by way of investment in what is now an entirely novel business. The Committee, however, are of opinion that, taking a long view, any investment such as they suggest will at least bring the necessary experience to help to establish flying ultimately on a paying basis.

The Committee realise to the full the unique character of the problem, which is, whether any, and if so what, steps can and should be taken now to develop civil transport over these routes in an element wherein the controlling and limiting factors are as yet very imperfectly understood. There is little guidance to be found in experience, but as compensation there are no precedents or vested interests to hamper an attempt to solve the problem.

The Committee have started from the basis that the problem is one which is capable of solution, that there is a future for the development of the air as a new means of civil transport and communication, in spite of the present handicaps from a technical, operational and financial point of view. They feel it necessary to endeavour to strike a mean between the view of those who, in contemplating the development of air transport, lose sight of the difficulties and dangers which at present beset it, and advocate too ambitious schemes, and those others who, while freely admitting the progress of aviation on the service side during the War and the great influences which that progress exercised on the position, are yet very doubtful whether the War development went so far as to establish even the practicability in the immediate future of making use of the air element for everyday commercial purposes.

The Committee have been impressed by the unanimity of the opinion of those who have identified themselves with development in civil aviation as to the fact that the problems involved in each section of an Imperial Route vary greatly and thereby render the formulation of a general Government policy exceptionally difficult at present.

The Committee accordingly find themselves without enough data or experience to justify them in recommending any rigid policy involving the immediate planning and initiation of any complete scheme of Imperial routes at present. They have come to the conclusion that in the meantime the correct policy is to initiate immediate action to obtain experience, and that such experience should be obtained on that part

of the whole field of Imperial routes which offers the best chance of success, leaving the initiation of action elsewhere for further consideration when fuller experience has been obtained.

They have no hesitation in deciding that the proper place for initial action is the route from this country to India, and ultimately thence to Australia. In the second place stands the route from this country to South Africa, which on the section from this country to Egypt would be the same as the first route. They consider it would be wise in the first instance to deal with the problem in reference to one section of the route from this country to India, viz., the section between Egypt and Karachi, leaving to the Indian Government the initiation and encouragement of the internal air routes in India. They are convinced that this section is the sphere in which experience can be most readily and usefully obtained, as the conditions of aerial navigation on this section are judged to be more favourable than elsewhere. Assuming that an air route is to be established between these points, the first question which arises is the broad question of principle as to the agency by which that work can best be undertaken.

The point has been made that at this moment the readiest way of testing the air possibilities of the route for civil purposes would simply be to give to the Royal Air Force squadrons stationed on or near the route the task of carrying mails, passengers, etc., in so far as their Service duties allow them to do so, or, in the alternative, to increase the formations for strictly Service purposes by additional formations to meet the civil requirements. The Committee have considered this method, and have decided against it. There are weighty Service objections against the use of the Royal Air Force for civil purposes, under either of the two alternatives above mentioned, and the Committee cannot avoid the conclusion that under neither alternative would the conditions be such as to enable any real judgment to be formed or experience gained as to the possibilities of civil aviation. They must also give weight to the consideration that private enterprise would be entitled to raise strong objection to State monopoly or direct State competition on what the Committee themselves find to be the best sphere for trying out the possibilities of the new form of transport. There is also the very important consideration that in the view of the Committee the development of aircraft for Civil and Service purposes must before long result in their differentiation into distinct types, and that consequently assistance in the development of commercial aviation cannot be permanently expected from the Service side otherwise than in the spheres referred to below, such as common use of aerodromes, wireless, and meteorological facilities, etc.

Assuming, then, that direct action by the Royal Air Force is set aside, the Committee have had to consider what other arrangements are feasible. They are met at the outset by the difficulty that without State aid in one form or another, they see no prospect, more especially in present financial conditions, of any private enterprise embarking capital in a venture of this description, where, as they have already observed, experience is lacking and many unknown factors will come in. The Committee have accordingly come to the conclusion that State aid in one form or another will be essential. They consider that there is a case for such State aid, holding that the moderate expenditure which in present financial conditions is all that should be contemplated is justified as an investment in an undertaking with very great ultimate possibilities. The Committee have considered three possible methods of organising the undertaking:—

1. Operation by the State itself.
2. The constitution of a Chartered Company combining State and private capital.
3. Private enterprise, State aided.

The Committee are against 1, operation by the State itself. They consider that in a new enterprise of this description, the work of initiation and development is work which the State cannot perform in such a way as to enable the possibilities to be properly tried out.

The Committee have had before them various suggestions for 2, the formation of a chartered company combining State and private enterprise. This proposal presents certain attractive features. It is argued that it would enable the organisation to be so formed as to contain representatives of different interests concerned, such as aircraft constructors, shipping companies, and the various departments of State, including the Post Office. It is argued that it would secure a single and uniform development of policy, the co-



ordination of all effort, the standardisation of material, the avoidance of any objection on the ground of monopoly, and more or less definite support to the existing aircraft contractors by preferential treatment in the supply of material. The Committee appreciate these arguments, but have come to the conclusion that they cannot recommend this form of organisation for the following reasons:—The enterprise under consideration is of all enterprises one in which it is essential that the direction should be free from stereotyped methods and open to new ideas and suggestions, even those which would normally be regarded as imaginative. The concentration of all British aerial effort into a single organisation would have a narrowing tendency likely to jeopardise success. There is serious risk that a chartered company would tend to develop a system of bureaucratic control, open to the same objections as direct control by the State.

The Committee consider that too much weight can easily be attached at the present to the arguments for standardisation.

They have, therefore, come to the conclusion that the third method is the sound one—i.e., the use of private enterprise with some measure of State aid behind it. They would point out that it is in this way that the development of British trade and industry has been attained in the past, and that it best secures the initiative and drive which are vital in the undertaking now under review. At a later stage of the general development it may well be that other methods may be usefully employed, but at this stage the Committee hold that the case is one for the application of the traditional British method of private initiative and private enterprise, with just such assistance from the State as is requisite for the securing of success.

They have considered closely the problem of the form which this State assistance should take. There are certain facilities required for air navigation which are clearly best provided by the State, such as meteorological and wireless information and the like. These the State should in any case provide, but the Committee think that it must go further and undertake the provision of what may be called Air Ports—i.e., the terminal and intermediate aerodromes and emergency landing grounds. The provision of these by private capital would lay an initial burden on the enterprise, which would be likely to be fatal to its inception. Further, if, as the Committee anticipate, the enterprise develops and establishes itself, it is on expenditure on Air Ports that the State might expect to obtain a return in the shape of charges for use. Moreover, the Committee are of opinion that, when aerial transport over Imperial Air Routes is an assured success, it will be of the greatest importance that the Air Ports should be owned and controlled by the State. The Committee regard this as an important factor in preventing operating firms from building up "good-will" of a serious character against the Government. State ownership will give a very full degree of control by the State over commercial flying and will prevent the very dangerous possibility of monopolistic control if the aerodromes were privately owned and merged into a trust. The Committee generally attach the utmost importance to the principle of State ownership and control of Air Ports, and they think the matter of sufficient importance to justify it being brought to the notice of all Governments of the Empire.

In the case of the Egypt-India Air Route, the Committee understand that it has been decided for purely Service purposes to establish and maintain aerodromes and landing grounds for the transit of machines to India, and that proposals to this end have been approved by the War Cabinet. Consequent upon this decision, it appears to them that the approval and execution of this scheme, while meeting Service needs, will also be a starting point for the civil development of the air route from Egypt to India; they are advised that the civil air route, at all events at the outset, will best follow the route laid down for Service machines. They strongly urge, therefore, that the Service proposals for joining India and Egypt by air should be put into effect as soon as possible.

They are advised that when this is done it will be possible to pass one civil machine per week each way between Egypt and India. It may well be that, as civil aviation develops, further facilities will be required, which facilities would naturally mean further expenditure on the routes for purely civil purposes. The Committee, while recognising that additional expenditure beyond that incurred on the establishment of this route for Service purposes is inevitable, as the facilities are increased, to meet civil requirements, find it difficult to estimate closely at the moment either the total amount so required or the periods when the additional expenditure will be necessary. But clearly the need for additional expenditure must be taken into account now.

It is then necessary to consider what concrete action should be taken to give private enterprise its opportunity of getting on to the route. The element in which the air has the advantage over other means of transport is speed. The Committee are advised, for example, that the time occupied in transit from Egypt to India by sea, namely, nine days at a moderate computation, could be reduced by not less than three-and-a-half days if the transit were made by air, and in the future might be still further reduced.

Accordingly, it would seem that the first step is to ascertain on what terms arrangements can be made for the carriage of mails by air—the carriage of express goods and of passengers being relied on as ancillary to the carriage of mails. The Committee recommend that the Post Office, in consultation with the Air Ministry, should forthwith draw up a form of tender for an air mail contract between Egypt and Karachi and/or Bombay. It would be put up to limited competition between firms of such standing as to make it reasonably certain that they could perform the services tendered for. This contract should provide for alternative tenders for services of varying frequency per week, and would be fitted in with the standing ocean mail contract. In calling for tenders it would be made clear what facilities the State would provide in the way of meteorological, wireless, and other information, and in the way of aerodromes and landing grounds. At the outset these facilities may have to be restricted to those provided under the purely Service scheme above mentioned, particulars of which, if approved, would be made known to tenderers, and which would cover the transit of one machine per week each way.

Tenderers would be requested to quote for more frequent services on the basis that the State would, in presence of the tenders, consider that further facilities as above could properly be provided.

It appears to the Committee that the above method of procedure is the only way of arriving at a judgment on experience of what the cost and income of an air route on this section is likely to be. In the light of this experience, the whole problem would be further considered, and a more general policy for further development prepared.

The Controller-General of Civil Aviation has, during the course of the meetings, informed the Committee as to what is being done for civil aviation in other countries, and the Committee understand that he is forwarding to the Secretary of State a statement of this information, from which it will be seen that in certain cases subsidies and other forms of assistance are given which are not included in the recommendations of this report. The Committee suggest as a possible additional form of assistance that a certain quantity of the aircraft engines and material which have been declared surplus by the Royal Air Force could be placed at the disposal of the Civil Aviation Department for distribution free in this country and the Colonies.

The Committee understand that in India and Egypt local regulations prevent any pioneer work whatever in civil aviation being carried out. The policy underlying these regulations is not a matter for the Committee. From the point of view of civil aviation, which is their concern, they consider it very desirable that all prohibitory bans on civil aviation, so far as those parts of the British Empire which are under the direct control of the Imperial Government are concerned, should be removed at once, and that representations be made to the Dominions and India in favour of the immediate acceptance of a similar policy.

The conclusions of the Committee may be summed up as follows:—

- (1) That the air route from Egypt to India should be developed.
- (2) That the development should be by private enterprise backed by State assistance, and that the State assistance should take the form of providing meteorological and wireless services and of air ports, including the provision of the sheds required for running purposes.
- (3) That the Service proposals for these air ports should be carried through as soon as possible.
- (4) That the necessity for additional expenditure on the development of these ports for purely civil purposes in order to meet the increase in frequency of the services should not be overlooked, though only experience can show what such expenditure may be.
- (5) That the G.P.O., in consultation with the Air Ministry, should draw up a form of tender for an air mail contract between Egypt and India to be put up for competition.
- (6) That a certain quantity of the aircraft engines and material which have been declared surplus by the Royal Air Force could be placed at the disposal of the Civil Aviation

Department for distribution free in this country and the Colonies.

(7) That the prohibitory bans on civil aviation in Egypt and India should be removed.

These modest recommendations are made on the assumption that the State intend to maintain flying supremacy by supporting the Service side at a level that will ensure the safety of the position.

The report is signed by Lord Weir of Eastwood (late Secretary of State for the Royal Air Force) (*Chairman*); Lord Inchcape of Strathnaver, G.C.M.G., K.C.S.I., K.C.I.E., Sir

James Stevenson, Bart. (Member of the Army Council and of the Air Council) (*Vice-Chairman*), Col. J. T. C. Moore-Brabazon, M.C., M.P., Mr. Charles I. de Rougemont (Chairman of Lloyds), Mr. H. White-Smith, C.B.E. (Chairman of the Society of British Aircraft Constructors), Mr. L. Bairstow, C.B.E., F.R.S., Air-Marshal Sir Hugh M. Trenchard, Bart., K.C.B., D.S.O. (Chief of the Air Staff), Maj.-Gen. Sir Frederick H. Sykes, G.B.E., K.C.B., C.M.G. (Controller-General of Civil Aviation), Sir W. Arthur Robinson, K.C.B., C.B.E. (Secretary of the Air Ministry), Mr. F. G. L. Bertram, O.B.E. (Air Ministry) (*Secretary*).

## Honours

THE War Office announced on November 26 that the President of the French Republic had awarded the Croix de Guerre to L. R. P. Harvey, M.C., 5th Lancers, att'd. R.A.F., for distinguished services rendered during the War.

## R.A.F. Decorations

IN the *London Gazette* of December 5 were published several warrants dealing with the ribbons for the Distinguished Flying Cross, the Air Force Cross, the Distinguished Flying Medal and the Air Force Medal, the creation of which decorations was announced in a supplement to the *London Gazette* dated June 3, 1918. The first warrant, dated June 3, 1918, prescribes the designs for the ribbons, with horizontal stripes, but the second warrant specifies the diagonal arrangement subsequently adopted. It sets forth that the Distinguished Flying Cross is to be worn on the left breast pendant from a ribbon  $1\frac{1}{4}$  ins. in width, in colour violet and white "in alternate diagonal stripes of  $\frac{1}{8}$  in. in width, running at an angle of 45 deg. from left to right." The ribbon for the Air Force Cross is similar, except that the colours are red and white, while the ribbons for the D.F.M. (violet and white) and the A.F.M. (red and white) are arranged in the same way, but the stripes are only half the width of those for the Crosses. A further Royal Warrant makes civilians eligible for the A.F.C. and the A.F.M., which are awarded for "acts of valour, courage, or devotion to duty performed whilst flying though not in active operations against the enemy." These two distinctions may under the revised regulation be awarded to "individuals not belonging to Our Air Force (whether Naval, Military or Civil), who render distinguished services to aviation in actual flying." The designs for the D.F.C. and the A.F.C. were illustrated in *FLIGHT* of August 28.

## Aerodromes and Landing-Grounds

LINTHORPE aerodrome, West Acklam, Linthorpe, near Middlesbrough, has been licensed as suitable only for Avro 504K and other similar types of aeroplanes. Luce Bay aerodrome, Stranraer, formerly a service station, has been passed over to the Disposal Board.

## Air Work on Indian Frontier

It was reported from India on November 25 that a few sub-sections of Mahsuds had come in asking for peace as a result of the daily air raids which have been carried out since November 13; but they were informed that until there was a general agreement among the tribe to submit to our

terms and a representative *jirga* makes surrender no such overtures could be entertained. On November 27 seven tons of bombs were dropped and 8,000 rounds of small arm ammunition fired. On November 28 three and a half tons of bombs were dropped and 5,200 round fired. Good results were obtained.

## Aerial Mails in India

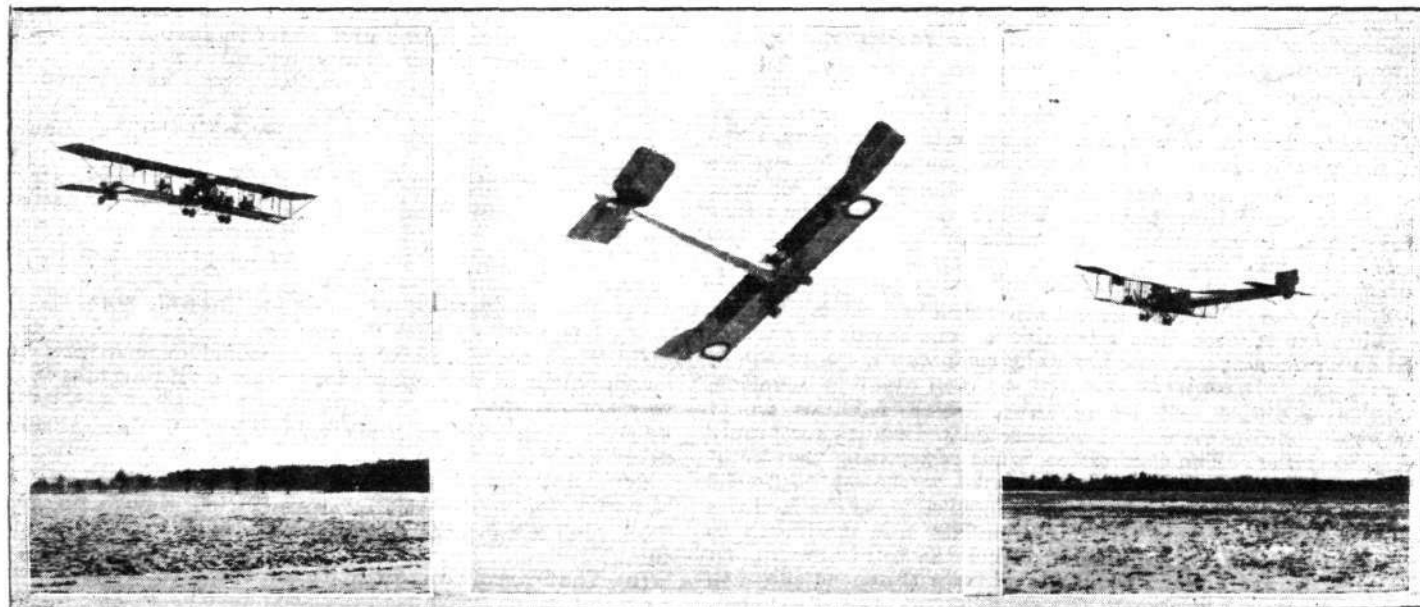
AN aerial mail service is to be inaugurated between Bombay and Karachi on January 1, by means of which residents of Karachi will be enabled to post home letters at least 24 hours after the dispatch of the mail steamer from Karachi and yet catch the steamer at Bombay.

## The Monaco Seaplane Meeting

THE International Sporting Club of Monaco is now busily engaged in organising the seaplane competition which is to be held at Monaco from April 18 to May 2, 1920, a week separating these events from the motor-boat meeting. The main event will be over three stages: 1. Monaco-Corsica (alighting on the sea at Bastia or Ajaccio)—Bizerta, 750 kiloms.; 2. Bizerta-Tunis-Sousse-Bizerta, 500 kiloms.; 3. Bizerta-Monaco direct, 750 kiloms. The winner will be the competitor which covers the course in three days and makes the best time over the last stage, the competitors being placed—firstly, according to the number of days taken for the three stages, and secondly, by the speed on the last stage. The prizes will be 100,000, 30,000, 12,000 and 8,000 francs. The machines must carry a useful load of 400 kilogs., except in the case of those fitted with a separate motor for the wireless installation, in which case an allowance of 30 kilogs. is made; all machines must be fitted with wireless equipment, and must be capable of climbing 2,000 m. in 45 mins. The body, engine and floats of the machine must be of the nationality represented. The main idea underlying the contest is that it represents a mail service, and at each stop the pilot will have to hand over a sack of sand weighing 1 kilog., and receive a similar sack in exchange. The start will be given at 6 a.m. on April 18, and the controls will be open between 6 a.m. and 6 p.m. each day.

The other events include an altitude competition, in which the prize is 10,000 francs, and a speed contest, on April 25, over the 125 kilom. course, Monaco-Cannes-Monaco-Mentone, for which the prize is 5,000 francs.

Entries close on February 29, and full details of the regulations can be obtained from the International Sporting Club, 10, Rue Auber, Paris.



Three views of a four-engined Sikorsky biplane in flight



## THE IMBER SELF-SEALING PETROL TANK

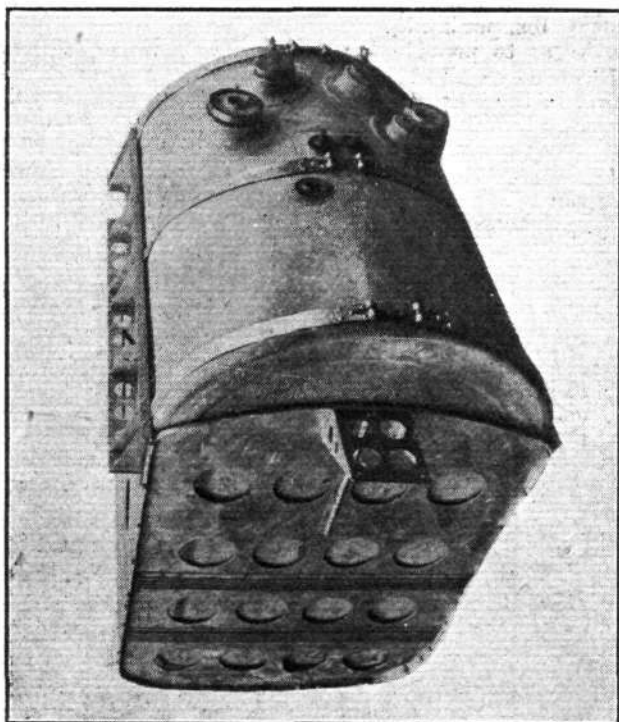
ONE of the outstanding inventions of the War, but one of which the general public has heard little, was the Imber self-sealing tank, which has now to be fitted to all Service aircraft. It is asserted that approximately 75 per cent. of the fatalities, which occurred previous to the invention of this tank by Mr. J. Imber, were directly attributable to the fact that the fuel tanks had been pierced and the leaking petrol had become a source of danger.

Many thoughtful persons had given their attention to the problem, but they were baffled by the fact that in many cases when an ordinary bullet passes through a tank it will tear a hole six or eight inches in diameter in the side of the tank

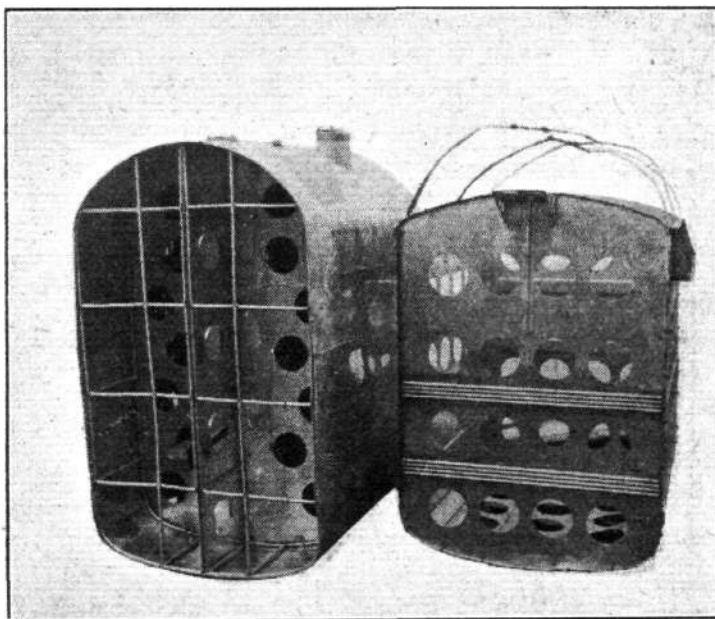
force from the point of entering to a distance of approximately 2 ft. 6 ins. Thus, when a bullet travels through a tank of large diameter, its momentum is checked before it goes entirely through, while, on the other hand, in a tank of ordinary size, it is found that up to a certain point the further one side wall is from the other, the larger will be the hole torn upon the exit of the bullet.

It was readily seen that the pressure generated in the tank would either have to be confined or released. Many inventors sought to confine the pressure, but results showed that when the bullet made its exit the pressure sought exit through the aperture made by the bullet, and in its effort to escape a large rupture is made in the tank.

Having acquired a knowledge of the action taking place in a petrol tank when it was pierced, Mr. Imber sought a



An Imber tank, in its cradle, as fitted on Airco (De H.) 9a machines



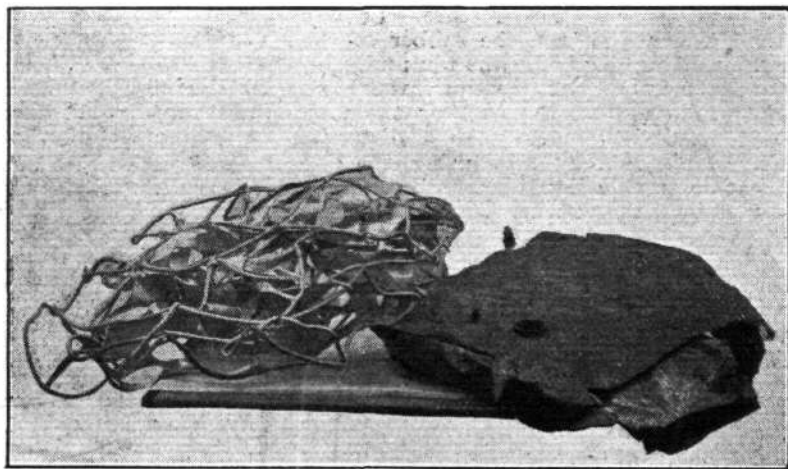
On the left, the interior of an Imber tank, and, on the right, the cradle as used on Airco 9a machines

opposite to that in which it enters. A large proportion of the devices proposed failed either because they were too heavy or some important detail of the structure was not properly disposed.

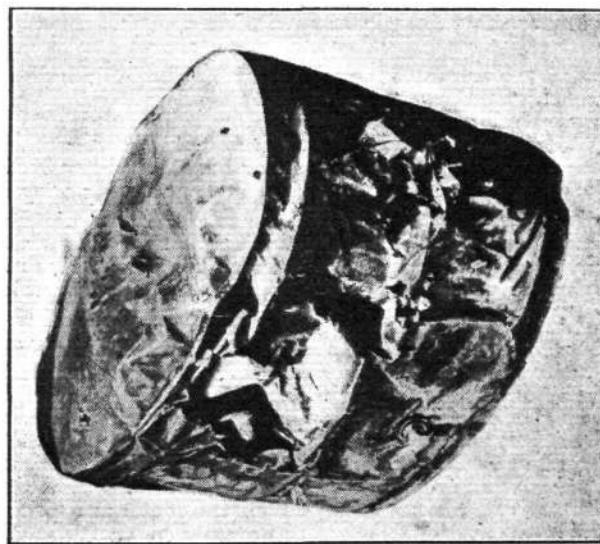
It may be pointed out that a bullet entering the fuel tank makes an aperture as large as itself, but in emerging a relatively large hole is torn in the metal. On investigating this Mr. Imber came to the conclusion that the larger hole was due to the great pressure of fuel against the far side of the tank. Upon entering the tank the progress of the bullet is somewhat arrested by the liquid, but in its travel through the tank the pressure of the liquid increases both in area and

means of perfecting a tank that would not only prevent leaking when pierced, but which would also prevent the escape of the liquid in the event of a bad crash.

In the Imber tank the pressure is allowed to escape by providing the tank with a resilient outer rubber covering, so that when the pressure exceeds a certain point the tank yields and the rubber stretches out from the side of the tank under pressure. Naturally, the highest point on the stretched



A 27-gallon Imber tank after being dropped from a height of 400 ft. from a Handley Page machine. On the left the framework, and, on the right, the covering. After this experience the rubber casing still held the petrol intact



Another Imber tank stripped of its cover after 18 shots had been fired right through it. Despite this treatment, the tank did not leak

rubber covering is that through which the bullet makes exit, and the rubber being stretched makes this point also the thinnest portion of the covering, so that when the bullet leaves and the pressure is relieved the rubber goes back to its former shape, completely closing up and sealing the bullet-hole.

When the Imber tank first appeared some experimenters with ordinary rubber-covered tanks suggested the use of angular section braces for framework and diaphragm or baffle-plate supports. Failures resulted, due to the fact that when the metal brace was bent outward against the covering, it required an equal amount of pressure from the outside covering to force the frame back in place, and allow the rubber covering to assume its normal position. The aluminium tubing employed in the Imber tank, after being bent outward, is easily brought back into place with a great deal less pressure than that required to bend it outward in the first place. The elasticity of the rubber covering is sufficient to force the bent tubular members back in place so that the bullet-hole is closed, but in cases where other inventors used angle frames the rubber covering was torn by the unyielding metal.

The Imber tank is composed of three parts, which are shown in section in the sketch: The inside tubular aluminium framework to which sheet aluminium baffle-plates are attached. The framework is adapted to fit within and conform to the

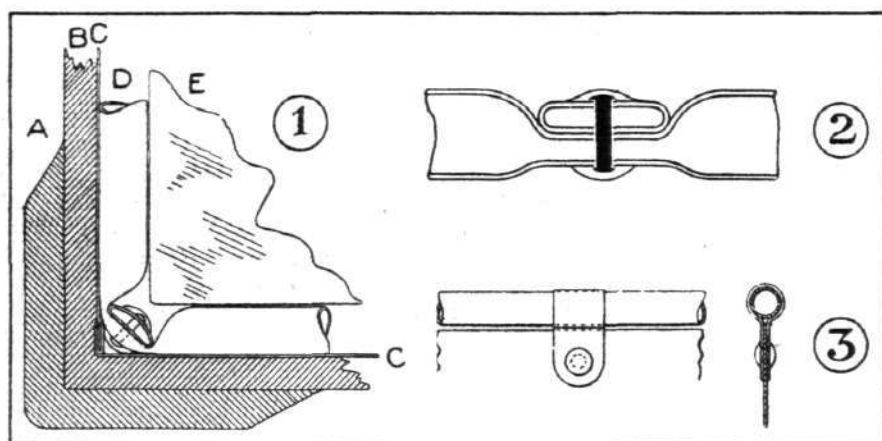
The function of the framework is to form a backing against which the rubber covering may seat itself to form a self-sealing covering.

The shell or casing is made of tinned steel. Other materials, including copper, were found to be inferior in some respects to the material finally adopted. Tanks with a capacity of more than 38 gallons are made of 28 gauge tinned steel. Joints are formed as indicated in Fig. 1. The joint is sweated, welded or otherwise formed without the necessity for the employment of rivets or other members passing through the metal.

The outer covering is of specially prepared rubber, which is put over the entire surface of the tank. The rubber is approximately  $\frac{1}{4}$  in. in thickness. Edges of the tank are reinforced with an additional rubber strip  $\frac{1}{4}$  in. thick, vulcanised to the covering rubber. The entire tank is then vulcanised for about 75 minutes under a steam pressure of about 40 lbs. per sq. in.

In order to provide for the greater security of the tank against leakage, all fittings are provided with double seatings, so that in the event of one joint giving away there will still be a second joint to prevent leakage.

In one convenient form of fitting the desired effect is obtained by having a flange internally threaded bush sweated upon the inside of the casing and surrounding the aperture for the fitting. Into this is screwed a second bush or sleeve



Some details of the Imber tank :  
1. Section of a corner : A, Rubber reinforcing ; B, rubber covering ; C, Outer shell or casing ; D, Framework members ; E, Baffle plate.  
2. Method of crossing the tubular members of the framework and of securing them with rivets. 3. The method of clipping the baffle plate to the inner framework of the tank

shape of the shell. The second part of the tank consists of a metal shell into which the baffle-plate frame is inserted. The third part of the tank consists of an outside rubber covering which surrounds the entire shell. The resilient or elastic covering returns to its seating against the framework in such a brief space of time that it is impossible for the contents to ignite in the event of the projectile being of an incendiary nature.

The tank is installed in the aeroplane by means of a cradle, in such a way that no rivets, bolts, etc., are used to secure it to the machine.

The general arrangement of the internal cradle or framework and baffle-plate is shown in one of our photographs. Of course, the principle is applicable to tanks of any shape or any size.

The framework is built up of aluminium tubing about  $\frac{5}{16}$  in. in diameter, and 22 gauge in thickness. The diameter and gauge of material varies according to the size of the tank. Where the tube crosses one another they are held together by rivets as shown in Fig. 2, or they may be welded together. Baffle-plates are secured to the framework by means of aluminium clips as shown in Fig. 3. The entire framework, together with the baffle-plates, is constructed so that no rivets or other means are used to hold it in place in the shell. It is imperative that the inner cradle be not fixed in any way to the metal shell.

carrying the fitting which makes the first-mentioned member a joint by means of fibre or packing. This second bush or sleeve projects beyond the rubber covering of the tank, and is surrounded by a metal washer which is forced into close contact with the exterior of such covering by means of a flange upon such sleeve so as to form a second joint or seating for the fitting. The inner bush is so constructed and arranged that it is practically flush with the inner surface of the metal shell.

No part of the fitting is allowed to project into the tank in a manner which would prevent the aluminium framework from being slipped into the tank.

Minor shocks are, of course, taken care of by the rubber covering, but when a hard blow is struck the internal construction gives. While the framework is strong enough to give adequate bracing to the tank under ordinary usages, it is purposely made collapsible upon the application of a blow likely to cause a puncture. In the case of a landing in which a smash occurs, the rubber covering retains the petrol, no matter how badly the tank may have been battered. While the framework of an aircraft may crumple and strike forcefully against the tank or the tank strike the ground, the result will merely be a distortion of the shape of the tank, thereby minimising the danger of fire from the inflammable liquid that otherwise would have been sprayed about the wreckage.

### Brazilian Air Mail

SOME details of the mail-carrying contract for Brazil secured by the Handley Page Co. have been sent by *The Times* correspondent at Rio de Janeiro.

The chief route along which the mails are to be carried is the international route, Pernambuco to Buenos Ayres, a distance of 2,500 miles, which will be covered in three and a-half days, compared with nine or ten days by the ordinary mail boat services. There will be a weekly service between these two points. The other air-mail routes covered by the contract include Rio to Sao Paulo and Sao Paulo to Santos.

The Handley Page Co. are sending out to Brazil 24 machines, which, besides carrying the mails, will inaugurate passenger and freight services. The machines are of the two-engine type, with a carrying capacity of 2,500 lbs.

### Dutch Experiences with German Machines

APPARENTLY the Dutch Government are finding their purchases of German aeroplanes anything but satisfactory. Anyway, an order has been issued by the commandant of the Dutch Aviation Department forbidding further flights in Rumpler aeroplanes, as there have been four fatal accidents with these German machines in the last few weeks.



## AIRISMS FROM THE FOUR WINDS

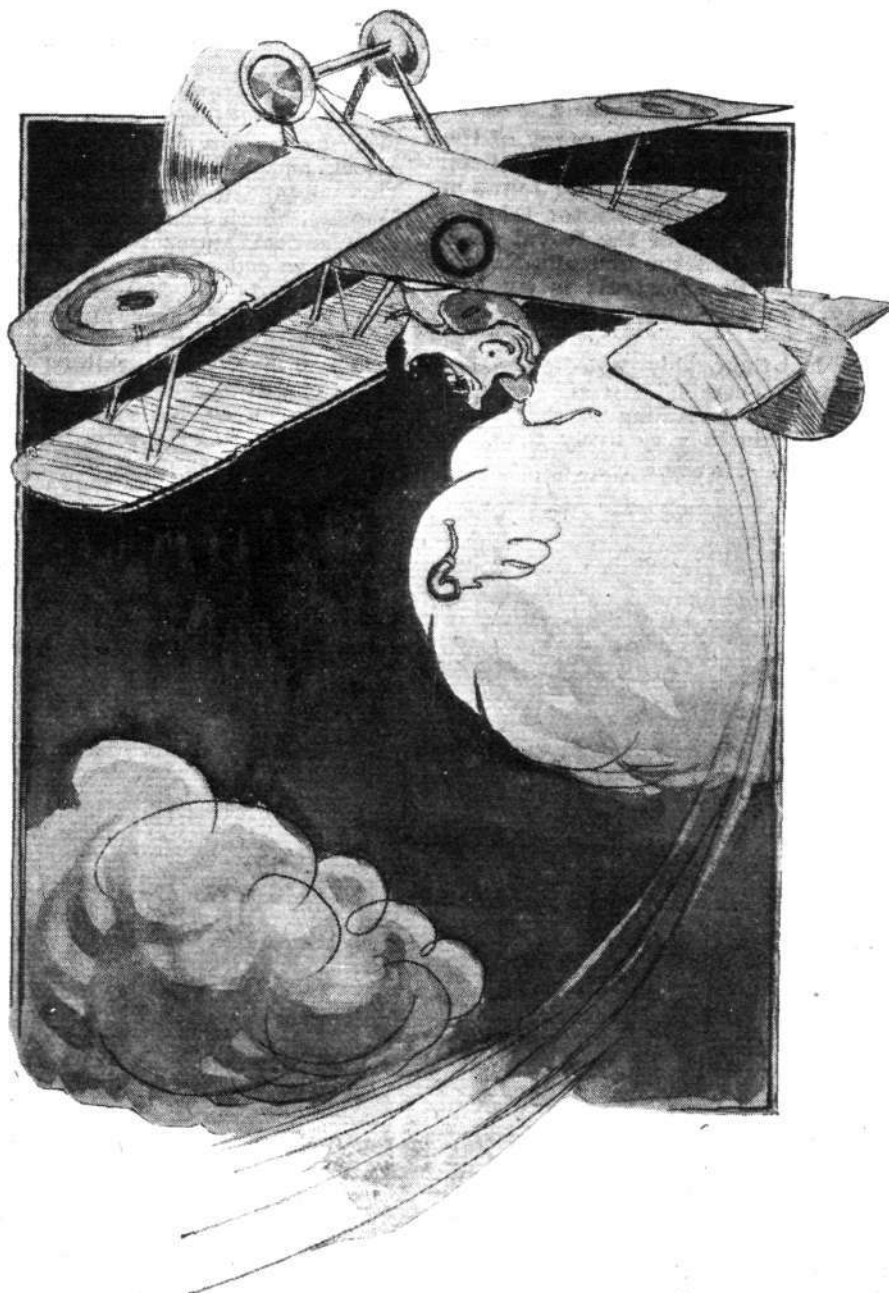
As an indication of the same old ethics prevailing in Hun diplomatic quarters and methods a telegram from Bucharest to the *Paris Journal* is instructive. From this it appears that Roumanian troops have captured a large aeroplane which had to land at Hotin, in Bessarabia, owing to engine trouble. The crew of the machine consisted of two German officers and three mechanics, who had with them 360,000,000 roubles for the Bolshevik troops in Ukraine, a printing machine to print bank-notes, and several thousands of jewels of all kinds. The aeroplane, it is stated, had been making a regular service between Germany and the Bolsheviks, and that the documents found on the machine leave no doubt as to the insincerity of Germany towards the Entente. Incidentally it's not a bad tribute to the usefulness of aeroplanes under emergency, even if the occasion happen to be an illicit one.

A RATHER round-about way of securing an aerial "souvenir" is disclosed in the *Yorkshire Observer*. A letter, our contemporary states, which went across the Atlantic in H.M. Airship R 34, the first lighter-than-air craft to cross from England to America, has just been delivered to Alderman R. Jackson (Deputy-Mayor of Todmorden). The letter was sent as a

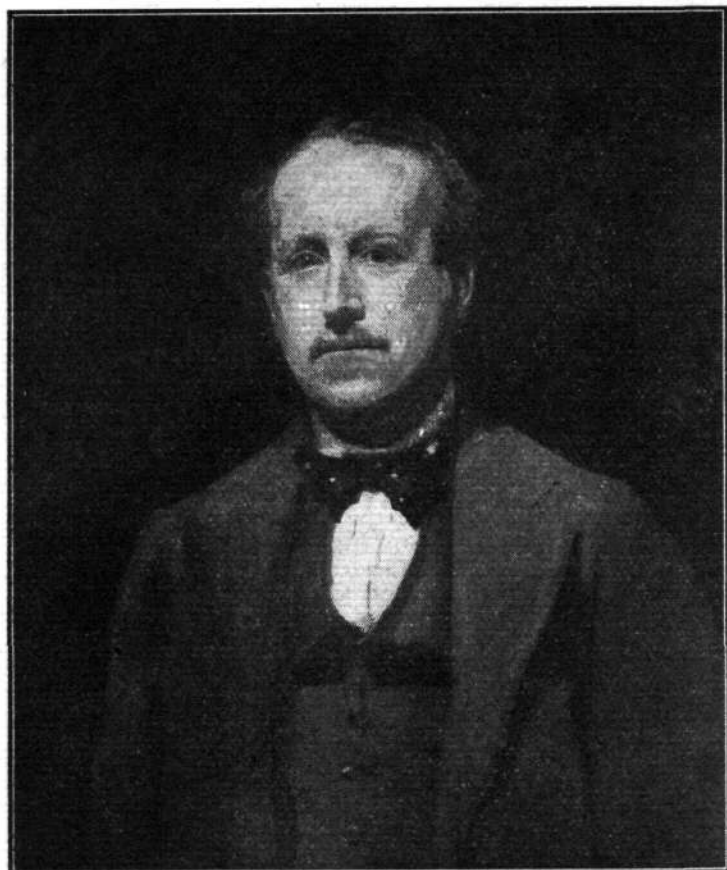
souvenir by a Todmorden officer in the Royal Air Force, with instructions for it to be posted in America. For some reason or other the letter was dropped in Nova Scotia on July 5, and after being sent to different parts of the country, it was forwarded to England on November 12. A charge of 3d. was made on delivery to Alderman Jackson.

And cheap at the price, we should think. But what was the original idea to be sought for anyway. We fancy there must be a missing link somewhere.

MANY stories of the ex-Kaiser's personal dread of air-raids have been current both during the War and subsequently. But none of these approach the reality, if the tales as told by M. Domelier in a book "*Au G.Q.G. Allemand*," just published (Paris, La Renaissance du Livre), are to be accepted as literally as the text sets out. In all things William apparently was fastidious almost to foppishness, although he lived very simply, most of his idiosyncrasies being begotten of his colossal vanity. "Everything with him," M. Domelier writes, "was for show. He knew of Napoleon's simplicity in the field, and himself slept on a camp bedstead lacquered white, but instead of erecting it in a tent, placed it in a



**MOST ANNOYING!—III. When you drop your pipe in the middle of a loop!**



Portrait of Mr. Claude Johnson, first secretary of the Royal Automobile Club, 1897-1903, which has been presented to the Royal Automobile Club. Mr. Johnson was the organiser of the 1,000 miles motor trial of 1900, etc., first honorary secretary of the Royal Aero Club, and has been managing director of Rolls-Royce, Ltd., since its foundation. The portrait is by Mr. Ambrose McEvoy, the well-known artist.

sumptuous villa, which he had thoroughly protected against air raids by a solid armouring of concrete."

His terror of air raids was entertaining to the people, and the French airmen gave him a very lively time. In

April, 1915, they dropped a bomb only 200 ft. from his villa and four more within 300 ft. After this he changed his sleeping place constantly. A year later the French population heard the humming of the aeroplanes and saw "imposing colonels, fat majors, terrified field-greys, and excited policemen rushing in the scantiest costume" for shelter. The servants and soldiers of the Kaiser's train, which was kept at Charleville, bolted for a dug-out just as a bomb fell on it, and were killed to a man; "the chief engineer, a personal friend of the Emperor, the head guard, the cooks and the other attendants met death in the panic flight of terror."

AFTER this William II left his villa and retired to a house at a distance where his quarters were protected by very strong steel netting, held up by piston-supports which would yield to a blow, with a very strong steel grating underneath. Even this did not satisfy him. He had a shelter of concrete 3 ft. thick constructed over his bed on huge steel supports; and in the garden a great concreted dug-out was prepared, which was lighted with electricity and capable of holding 30 persons. Numerous batteries were established to protect him, and when he went about he was followed by an anti-aircraft gun on a motor.

WHAT the author discloses of "Little Willie" is best passed over. If true, it makes one wonder more than ever at the mentality which could regard such a "thing" as the guiding head of anything in the world. M. Domelier, who was editor of a French newspaper at Charleville before the War, had unexampled opportunities of studying these two Imperial buffoons, as when the Germans invaded France in August, 1914, Charleville was chosen as the ex-Kaiser's headquarters, where they remained for two years, M. Domelier during all this period never ceasing his vigilant observation.

On Monday next, the first step in the formation of a permanent Aeronautical Museum for London, is to be taken. Upon that day Messrs. Vickers, Ltd., will present to the nation the Vickers-Vimy-Rolls-Royce aeroplane on which Sir John Alcock and Sir A. Whitten Brown crossed the Atlantic. This will take its place in a part of the extension of the Science Museum, South Kensington, and will form the nucleus of an Aeronautical Museum in this building. The occasion is also to be endorsed at a luncheon given jointly by Messrs. Vickers, Ltd., and Messrs. Rolls-Royce, Ltd. The housing room lent by the Science Museum will be retained, it is understood, until a large permanent building can be secured in which to display the exhibits. A strong committee, led by Sir Richard Glazebrook, is now engaged in laying out the main lines on which the museum will be organised and making plans for securing exhibits.



**THE NEW HANDLEY PAGE W.8 BIPLANE:** For some considerable time there have been rumours of a new type of H.P. which was going to surpass anything hitherto seen in the way of luxury and comfort. The machine is now an accomplished fact, as will be seen from our photograph, and for once rumour has not been far from the truth. The new H.P., which is fitted with two 450 h.p. Napier Lions, is smaller and faster than the War types, and has a magnificent saloon cabin seating from 15 to 20 passengers. A feature of this is that there is no transverse cross bracing, so that the passengers have ample room to move about, while, if the machine be used for the carrying of cargo, the space available is 470 cub. ft. The machine has a maximum speed of 112 m.p.h., and a cruising speed of 90 m.p.h., while the landing speed is as low as 45 m.p.h. After a short test flight of only 20 minutes' duration, the machine was flown to Paris in 2 hours 10 minutes.





A Record Breaker: As announced in "Flight" last week, a Napier-engined Airco (De H.) 9 R, piloted by Capt. Gathergood, established a number of British records for speed on November 15, 1919. Our photograph shows the machine used for the flights. Capt. Gathergood, the pilot, is standing in front of the machine

SANTA CLAUS up-to-date is to be exemplified this year by the delivery of parcels of Christmas presents from Paris to London and *vice versa*, carried in Handley Page machines.

TEN million miles per annum of aerial patrol were carried out by the Royal Naval Air Service during the War. This statement of fact emerged in a lecture, entitled "How We Kept the Seas," by Capt. Evans, D.S.O., R.N., at Queen's Hall last week, when Sir Eric Geddes presided.

SIR PERCY SCOTT is nothing, if he is not thorough. Fortunately for this country, he never misses an opportunity of rubbing in his convictions as to the vital necessity of Great Britain being supreme in the air against future contingencies. Speaking the other day upon "Probable Future Developments in the Navy" at an "At Home," given by Mrs. Ronald Greville, in connection with the Waifs' and Strays' Society, at her residence, 16, Charles Street, Sir Percy once again expressed his belief that submarines and aeroplanes would revolutionise naval warfare of the future. Of battleships costing seven millions he believed that no more would be built. Their place would be taken by submarines and aeroplanes, the latter capable of travelling 150 miles an hour.

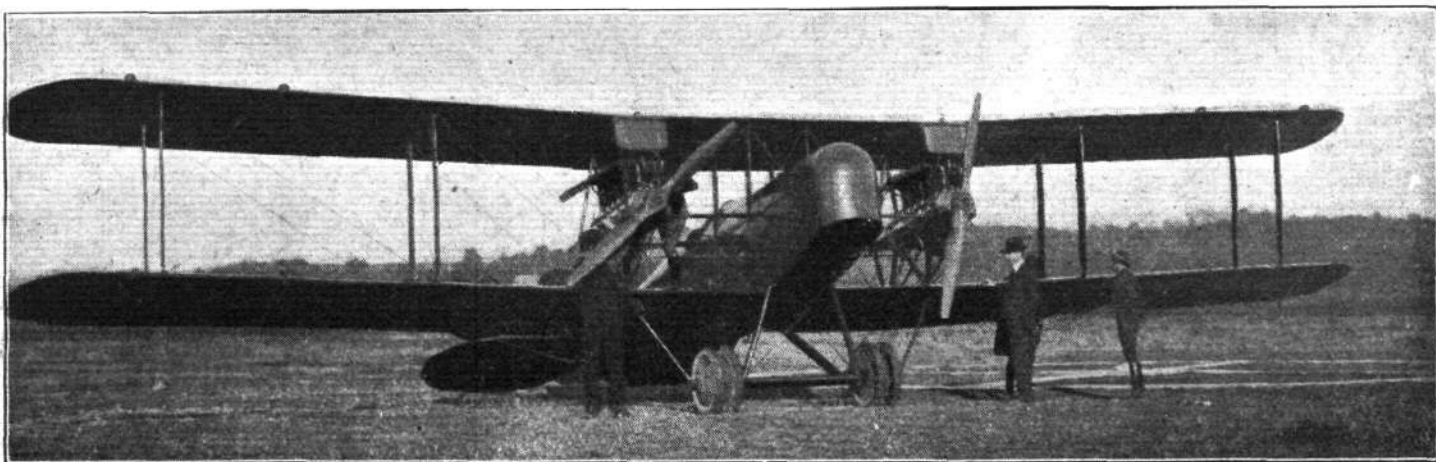
WHAT Manchester thinks today, the country endorses tomorrow. Therefore, it is good hearing that a special sub-committee of the Parliamentary Committee of the Manchester Corporation has been appointed to consider the possibility of taking over the Alexandra Park Aerodrome for use as a municipal aerodrome. There appears, however, to be a fly in the ointment, as it may be another of the Government's Lord Rosebery's "Dora, by Grace" ramps. According to the *Manchester Guardian*, the Air Ministry took over the land for the site from Lord Egerton some three years ago, but whether they have full power to dispose of it now appears to be a debatable point, although the Ministry assume they have such power. Much will turn on the nature of the

agreement between Lord Egerton and the Ministry. The aerodrome covers an area of 165 acres. "It is highly desirable," says Alderman Kay, "that the aerodrome should belong to the city. Whether it should be used solely as a flying ground is not the most pressing point. We urgently require an exhibition ground and hall for agricultural shows and outdoor functions generally, and the nearness of the Alexandra Park Aerodrome to the centre of the city makes it an ideal place for the purpose."

On December 4, the W.R.A.F. was finally demobilised, the "closing-down" being witnessed by its Commandant, Dame Helen Gwynne-Vaughan and the staff at Headquarters. Its spirit, however, still lives in the Women's Comrades of the War Association, brought into existence, as recorded in last week's *FLIGHT*. This "Club" is the first women's corps to be so inaugurated. Run upon the democratic lines laid down in its constitution, the Association should be a marked success.

ALTHOUGH the French were considerably in advance of us in the early days of dirigible construction, it is, we understand, a fact that the French Government are placing an order for four airships to be built in this country. This should about balance our "imports" of the Lebaudy and Clement gas-bags, which at one time so contributed to the mirth of nations.

LAST week the *Daily Mirror* gave a portrait of Miss Nancy Lees, the Handley Page chauffeuse, who recently captured a man who was stealing a motor car, and added "she is in fancy dress," for which much thanks, as the "costume" of this intrepid young lady consisted, in the main, of a model about 5 or 6 ft. long, of an aeroplane, plus a 2-ft. propeller and boss as head-gear, we might otherwise have thought that it was one of the latest Parisian creations to attract our *nouveaux riches* this side.



An American de Havilland converted from a single to a multi-engine machine. The engines are two six-cylindered Libertys, one of which is capable of maintaining the machine in flight. It is being used, in conjunction with the Martin "bombers" for mail-carrying, and is said to be nice and easy on the controls

# AIRCRAFT UNDERCARRIAGES\*

BY JOHN D. NORTH, F.R.A.E.S., F.R.MET.SOC.

THE undercarriage is described in the Society's Glossary as "That part of the aircraft beneath the body intended for its support on land or water and to absorb shock on alighting."

It is my intention to confine my remarks in this paper to undercarriages designed to support aircraft on land, that is to say, colloquially, "landing gears." The reasons for this limitation are obvious; it is scarcely possible to compare even in a general manner the undercarriage problem of the land machine and the seaplane, and in the latter case the already wide subject has to be extended to consider float design.

The historical development of the undercarriage shows well-defined phases reflecting the performances and functions of the complete aircraft. In the early Wright machines, which were provided with a launching gear, the problem of alighting only required to be considered. The light weight and slow landing speed of the aeroplane demanded but slight shock absorbing capacity and long skids only were fitted to bridge inequalities in the ground.

Contemporaneously in France and in this country attempts were being made to fly without launching gears. As the amount of time spent in taxi-ing, or "rolling" as it used to be called, represented a very large proportion of the total "flying" time, the undercarriages were designed to meet these conditions. The outstanding feature was the extensive use of swivelling forks carrying the wheels, the erratic course of the machine in its frantic efforts to rise requiring a liberal measure of tracking. As these machines frequently suffered disaster, being upset by running into ditches and so forth, the idea of combining the wheel and skid was materialised in the Henri Farman undercarriage. This had very long skids, each provided with two wheels mounted on a common axle and sprung to the skid with rubber. This system was

extensively adopted, but as the performance of machines improved the skid gradually became shorter and shorter till in the well-known and almost universal "Vee" type undercarriage it disappeared altogether. At the same time the arrangements of springs and radius rods provided in the original Farman also died out. It is perhaps interesting to recall that the "Vee" undercarriage was extensively condemned on its appearance as highly dangerous.

Fig. 1 shows diagrammatically the process of development culminating in the "Vee" type undercarriage.

By a similar process of development the wide-track Farman chassis developed into the typical undercarriage of the twin engined machine exemplified by the Vickers Vimy and the Handley Page, while in a different form it appears with two wheels only in the B.A.T. and the Boulton and Paul Bourges (see Fig. 2).

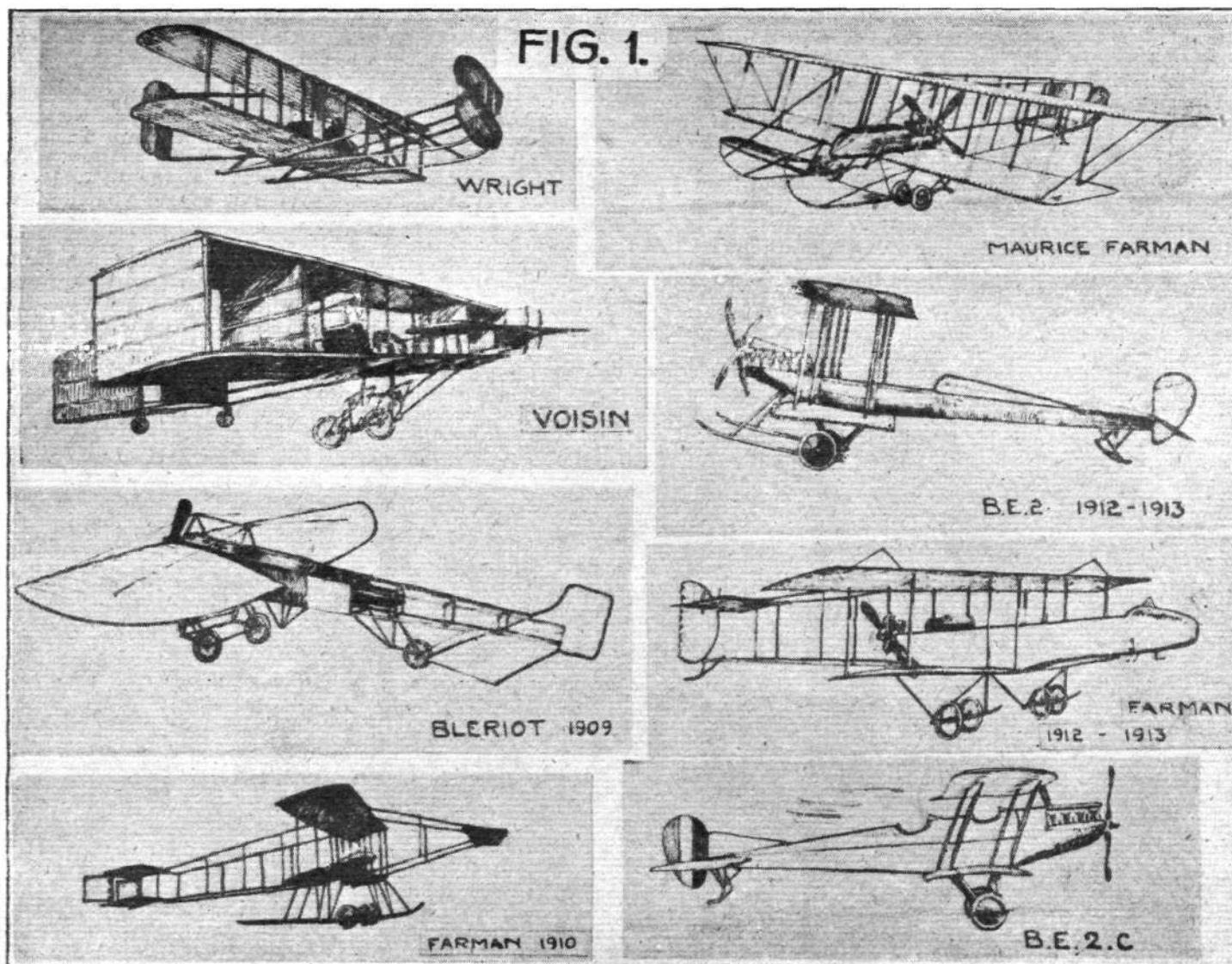
The most notable departures from these types originated in the Breguet Oleo gear, which is shown developing into the R.E.7 and F.E.2C. Oleo gears. The undercarriage of the Avro tuition machine may be traced to the early single wheel R.E.P. (Fig. 3).

I hasten to add that I do not suggest that all designs subsequent to the original type were plagiarisms, but rather that they represent natural lines of development.

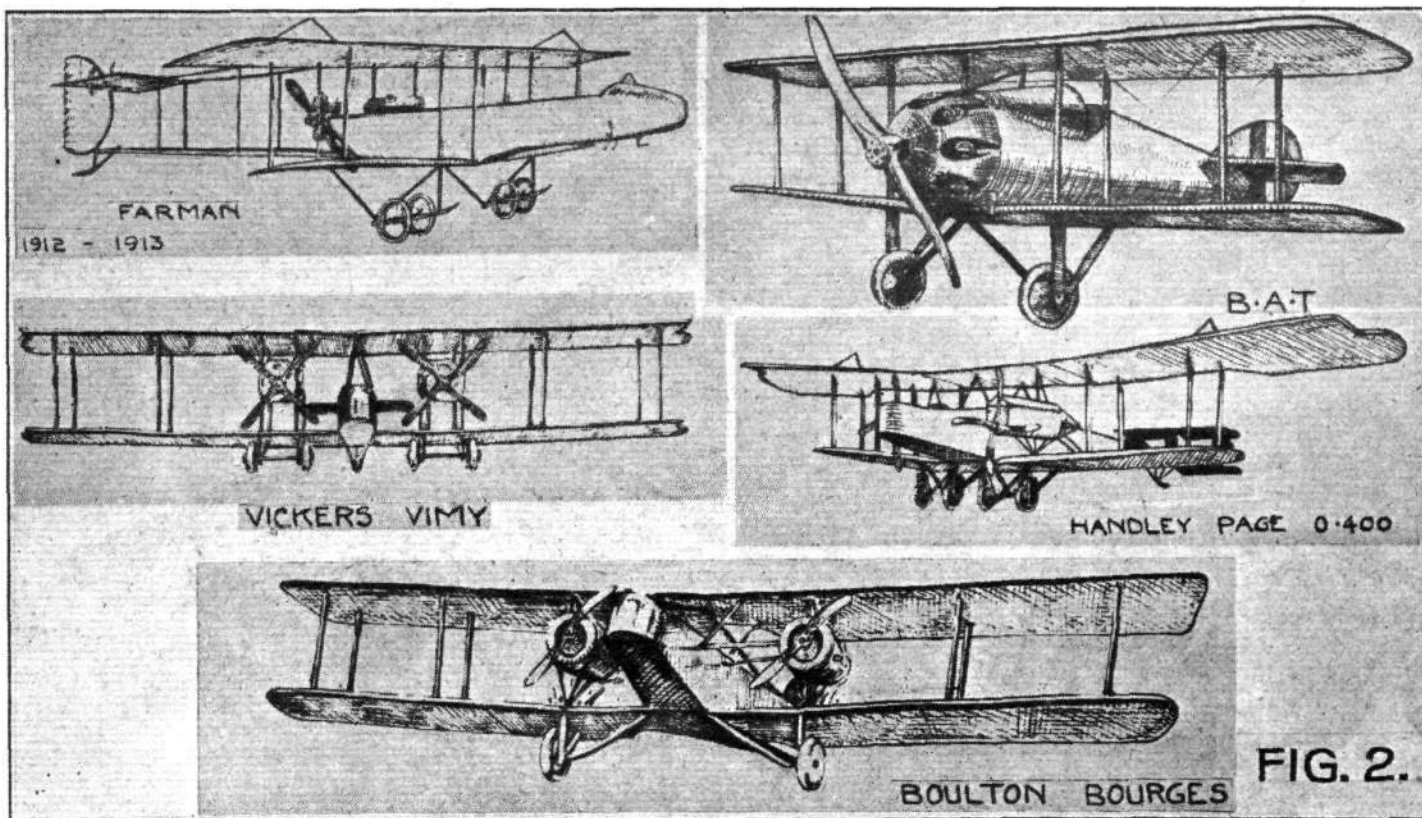
Of the final types found in general use there is no doubt that the "Vee" holds the field by sheer weight of numbers, and the reason for this is not far to seek. The development of aircraft has been almost exclusively military for the last five years and, in considering the safety and utility of an aeroplane, danger from enemy action was an important item.

By cutting down the resistance of the undercarriage to a minimum a definite improvement in performance was obtained and the consequent added security in action more than compensated for any increased difficulty or danger in landing.

\* Paper read before the Royal Aeronautical Society, at the Royal Society Arts, John Street, Adelphi, on Wednesday, December 10, 1919.







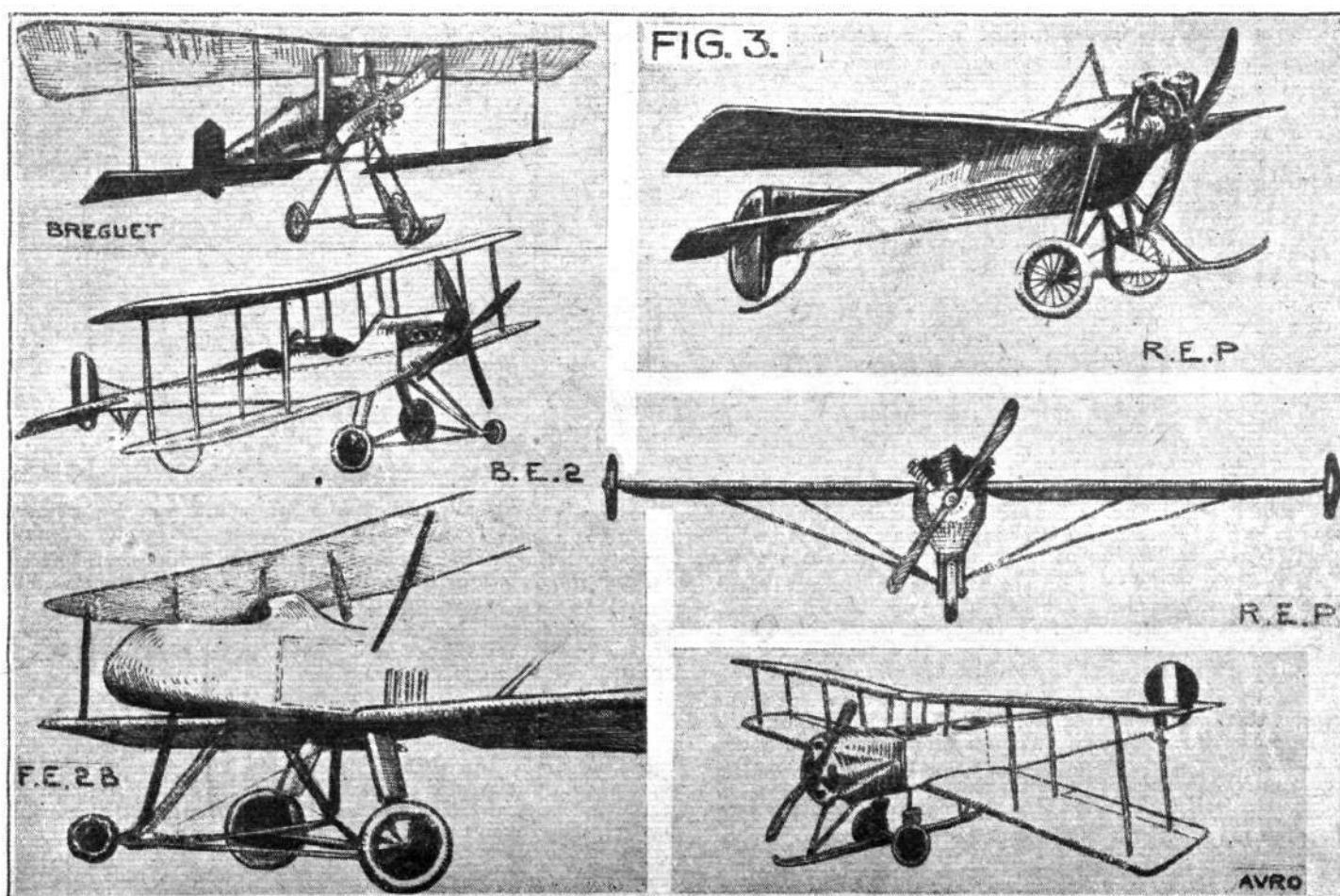
The use of the "Vee" gear has been principally confined to the smaller types of aircraft, but it must be realised that the large craft were in an elementary stage compared with their smaller sisters, and it is difficult to find a case of a large machine whose performance was in itself, or could be by reducing undercarriage resistance, be made to be a protection against enemy action.

Where aircraft are to be used for civil purposes, or where military aircraft are required in peace to have a longer term of life than in war, improvements in undercarriages would seem to be an essential part of their development. There is little doubt that the shock absorbing capacity can be greatly

increased, and at the same time provision made for landings side to wind or with the machine canted or tilted.

The shock absorbing capacity of an undercarriage depends on the total forces that the structure will stand without failure, and also the amount of travel of the shock-absorbing gear. We may first consider the most elementary form of undercarriage, i.e., pneumatic tyred wheels mounted on a rigid axle, as shown in Fig. 4.

The machine has a vertical component of velocity  $u$  when the wheel touches the ground and, as we are only considering the machine being brought to rest in the vertical plane, we may take the kinetic energy as  $mu^2/2g$  (foot-pound units).



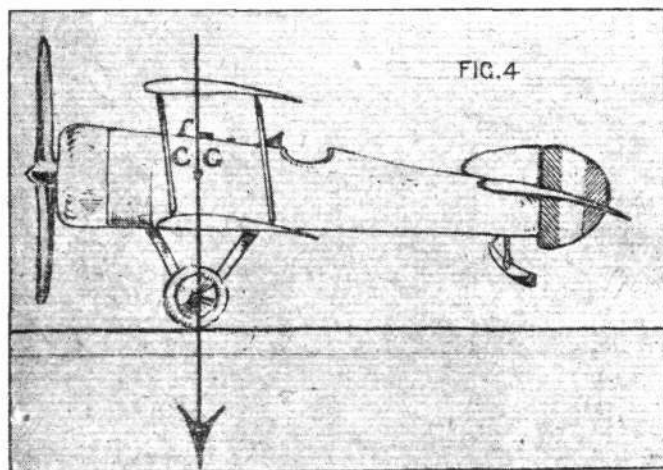
The force  $P$  on the tyre is a function of the tyre deflection ( $x$ ), hence total energy absorbed by the tyre is

$$\int_0^a F(x) dx$$

where  $a$  is the deflection when  $P$  has reached the maximum permissible load. Hence the limiting vertical velocity is given by

$$u = \sqrt{\frac{2g}{m} \int_0^a F(x) dx}$$

Fig. 5 shows an experimental curve for  $P = F(x)$ . The values of the deflection with diminishing load are not the



same as those with increasing load. Consequently the vertical velocity after the tyre has again expanded ( $u_1$ ) will be

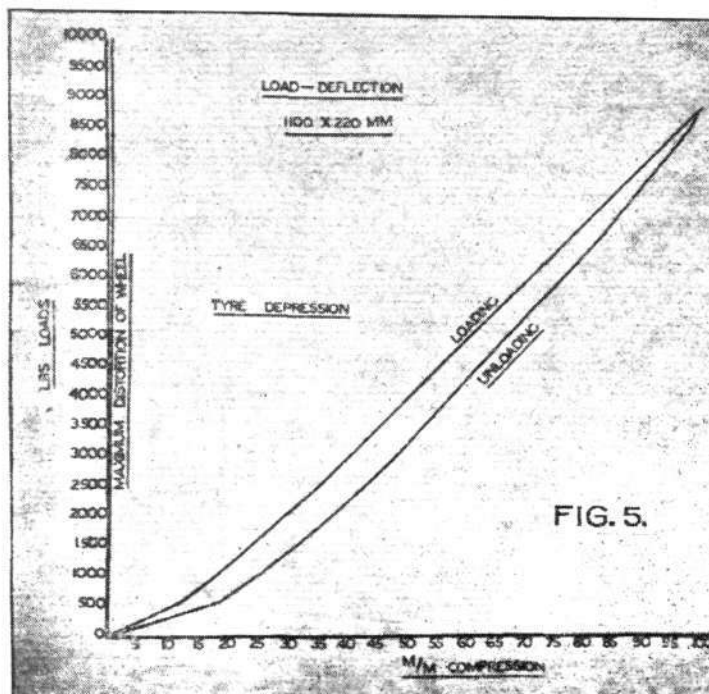
$$u_1 = \sqrt{\frac{2g}{m} \int_0^0 F_1(x) dx}$$

The area of the hysteresis loop represents the energy dissipated in heat. In composite structures such as tyres the dissipated energy may possibly be partly accounted for in other ways, but it is not necessary to consider this in detail here.

The aeroplane, rebounding with a vertical velocity  $u_1$ , will leave the ground and strike it again with a velocity  $u_2$ . It is obvious that  $u > u_1 > u_2 \dots > u_n$ , etc., and the C.G. of the machine gradually comes to rest in the vertical plane.

Consider first a tractor aeroplane with "Vee" type undercarriage.

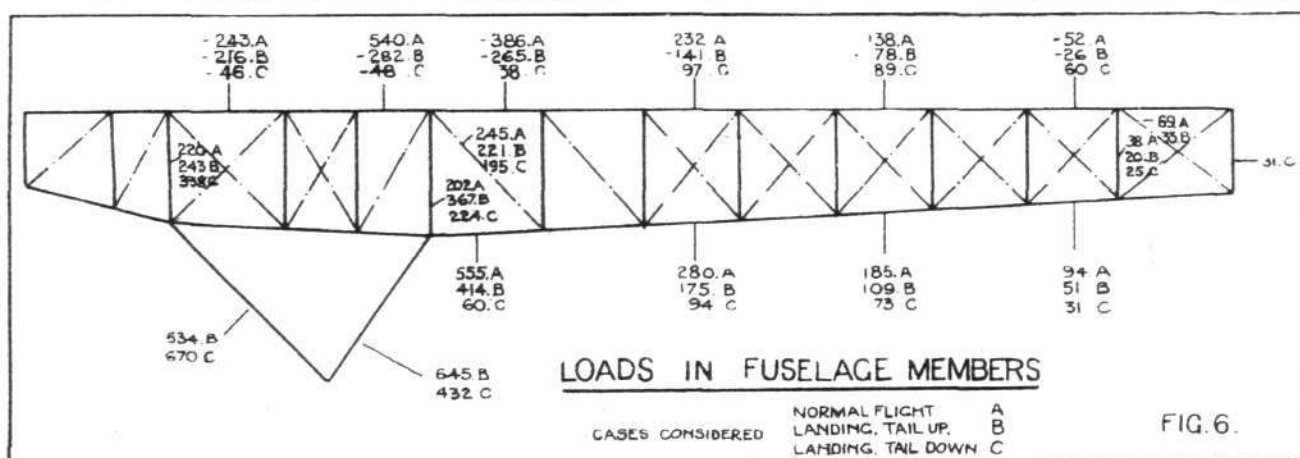
The principal vertical forces acting on the machine in flight are shown in the accompanying figures (Figs. 6 and 7). They are similarly shown for two extreme cases of landing—



(1) C.G. over wheel, (2) wheel and skid touching ground simultaneously.

It will be seen from the stress diagrams that an "undercarriage" load factor of the same order as the "flight" factor is an economical value. In the case of an undercarriage mounted on the planes this is even more obvious.

The weight of structure to take the down loads on the wings is unimportant. The maximum tail skid load (with the chosen factor) is often of the same order as the maximum down load on the tail and of the opposite sign, hence the rear part of the fuselage can economically be made symmetrical (structurally if not geometrically). The load on the tail skid is determined by the position of the wheels in relation to the C.G. when the machine is at rest on the ground. It is obviously desirable that the incidence of the main planes with the tail skid on the ground should approximately



Before considering the variations in shock absorbing effect arising from different forms of landing gear, we may first discuss the permissible values of  $P$  or rather the ratio  $P/W$  ( $W$  being the weight of the aeroplane.) This is usually termed the load factor.

The value of this factor will be influenced by the structure of the aeroplane as designed for flight. It may be accepted that machines are designed with flight load factors of 8 to 4 according to type. That is to say, they are designed to withstand the stresses arising from steady flight, supposing  $g$  to be increased to  $8g$  or  $4g$ . It is essential, therefore, if the structure weight of the aeroplane is to be kept low, that the greatest advantage should be taken of the "flight" structure and that the added weight to withstand landing loads should be a minimum.

correspond to the angle of maximum lift for the planes (say  $14^\circ$ ). At the same time, to prevent the machine from turning over on its nose, the angle between the line passing through the C.G. and the point of contact of the wheels and ground and the vertical (the thrust line being taken horizontal) should not be less than a minimum angle  $\delta$ . The ratio of load on tail skid to load on wheels will then be given by

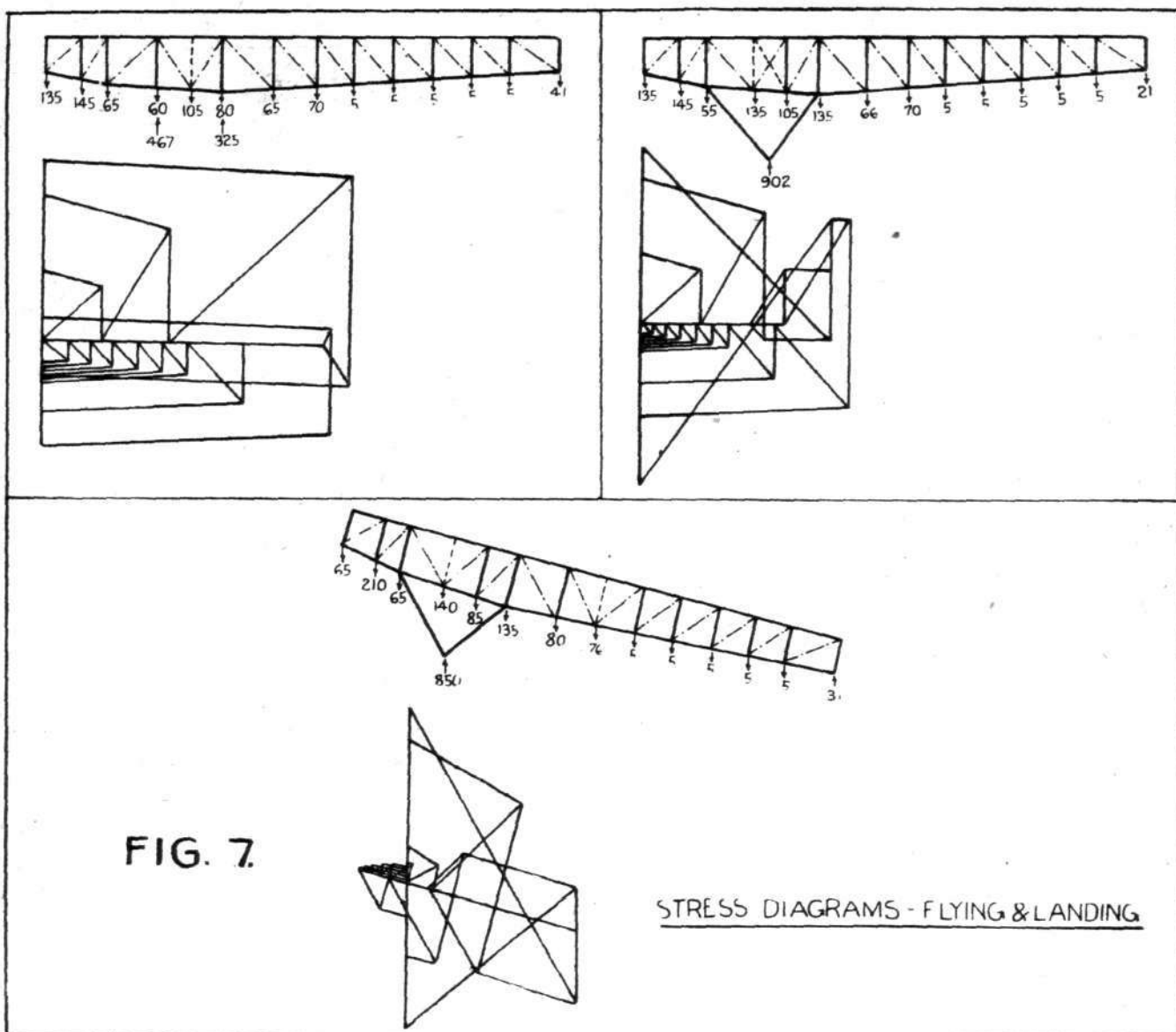
$$\frac{\text{Weight on skid}}{\text{Weight on wheels}} = \tan(\beta + \delta) \tan(\beta + \epsilon),$$

where  $\delta$  is defined above.

$\beta$  is the angle the thrust line makes with the horizontal when the skid is on the ground.

$\epsilon$  is the angle between the line joining the skid to the C.G. and the thrust line.





# THE ROYAL AIR FORCE

London Gazette, December 3

The following are granted permanent commissions, in the ranks stated, with effect from Aug. 1:—

**Flight Lieutenants.**—A. Gray, M.C. (A.), \*A. P. Maurice, D.F.C. (A.), \*O. C. Bryson, M.C., D.F.C., A.M. (A.), J. A. MacNab (O.), \*D. S. Eap (O.).

**Flying Officers.**—\*A. L. M. Van der Byl (A.), R. M. Trevethan, M.C. (A.), G. E. Randall, D.F.C. (A.), C. L. Wauchope (A.), A. Jerrard, V.C. (A.), J. M. Mason, D.S.C., D.F.C. (A.), L. C. Hootton, M.C. (A.), \*H. C. E. Bockett-Pugh (A. and S.), \*L. M. Hilton (A.), \*A. F. Lang (O.), C. A. Bouchier, D.F.C. (A.), H. A. Haines, D.F.C. (A.).

\* Subject to Medical Fitness.

The classification of Capt. A. A. B. Thomson is "(A.)" and not "(S.)," as stated in *Gazette* Aug. 1.

The notification in *Gazette* Aug. 1 appointing Maj. C. S. Danby, M.C. (A.), to a permanent commission, is cancelled.

The notification in *Gazette* Aug. 1 appointing Capt. T. Gran (T.) to a permanent commission, is cancelled.

The following temporary appointment is made at the Air Ministry:—**Staff Officer, 3rd Class.**—(P.) Flight-Lieut. A. H. Stradling; Nov. 18.

## Flying Branch

Capt. C. B. Dalison, A.F.C., is graded for purposes of pay and allowances as Maj. while employed as Maj. (A. and S.), from May 1 to Oct. 23 (substituted for notification in *Gazette* Oct. 21).

Flight-Lieut. (actg. Sqdn. Ldr.) S. W. Dunckley relinquishes the actg. rank of Sqdn. Ldr. on ceasing to be employed as Sqdn. Ldr. (A.); Nov. 11.

Flying Officer (actg. Flight-Lieut.) E. Burney, M.C., relinquishes the actg. rank of Flight-Lieut. on ceasing to be employed as Flight-Lieut. (A.); Nov. 11.

Sec. Lieut. S. Soothill to be Lieut.; Nov. 13, 1918.

Pilot Officer N. Hickson to be Flying Officer; Sept. 9.

Sec. Lieut. W. C. Snowden (late Gen. List, R.F.C., on prob.) is confirmed in rank as Sec. Lieut. (O.); June 3, 1918.

The following relinquish their temp. R.A.F. commissions on return to Army duty:—Flying Officer K. M. Harris (Sec. Lieut., Suff. R.); Nov. 1. Flying Officer C. Joiner (Lieut., E. Surr. R.); Nov. 8. Flight-Lieut. C. R. Richardson (Lieut., E. Yorks. R.); Nov. 10. Flying Officer E. G. Williams (Lieut., Essex R.); Nov. 10. Flying Officer P. Perfect (Lieut., K.O.S.B.); Nov. 12.

Flight-Lieut. R. F. S. Manduit, M.C. (Lieut., Dragn. Gds.); Nov. 17. Flying Officer J. C. C. Piggott (Lieut., Duke of Corn. L.I.); Nov. 18.

The following relinquish their temp. R.A.F. commissions on return to Naval duty:—Sqdn. Ldr. R. S. Robinson, O.B.E. (Lieut.-Comdr., R.N.); Oct. 14.

Pilot Officer D. P. Davidson (Sub-Lieut., R.N.); Nov. 3. Flying Officer R. B. Gibb (actg. Lieut., R.N.); Nov. 8.

Flight-Lieut. G. E. Wildman-Lushington (Capt., R. Marines) relinquishes his temp. R.A.C. commission on return to duty with R. Marines; Oct. 23.

(Then follow the names of 91 officers who are transf'd. to the Unemployed List under various dates.)

The following Lieuts. relinquish their commissions on account of ill-health, and are permitted to retain their rank:—D. MacGregor (K.O.S.B.) (caused by wounds); Nov. 13. C. A. Bradnam (contracted on active service); Nov. 22. N. W. R. Mawle, D.F.C. (Lond. R., T.F.), (caused by wounds); Nov. 24. D. G. H. Meade (contracted on active service); Nov. 26.

The following Sec. Lieuts. relinquish their commissions on account of ill-health (caused by wounds) and are permitted to retain their rank:—C. Houlgrave, E. J. Norris; Nov. 25. Sec. Lieut. R. J. Barnes resigns his commission; Aug. 26, 1918.

The surname of Lieut. A. H. Ashton is as now described, and not "Ashtch," as stated in *Gazette* Nov. 14.

The Christian names of Sec. Lieut. Henry Dan Lewis are as now described, and not "Henry Van," as stated in *Gazette* Nov. 4.

The initials of Lieut. J. O. Barclay are as now described, and not "J. B.," as stated in *Gazette* Jan. 21.

The surname of Lieut. F. M. McLellan, D.F.C., is as now described, and not "McLennan," as stated in *Gazette* July 22.

The notification in *Gazette* Oct. 21 concerning Sec. Lieut. L. T. Lawrence is cancelled. *Gazette* April 18 to stand.

The notification in *Gazette* April 1 concerning Sec. Lieut. N. H. Howe is cancelled.

## Administrative Branch

Flying Officer F. V. Goode to be Flying Officer from (S.O.); Nov. 10.

Flying Officer (actg. Flight-Lieut.) W. H. Hoile relinquishes the actg. rank of Flight-Lieut. on ceasing to be employed as Flight-Lieut.; Nov. 13.

Sec. Lieut. E. Staples (since demobilised) to be Lieut.; Nov. 13, 1918.

Sec. Lieut. T. Mumford to be actg. Lieut. whilst employed as Lieut. from Aug. 8, 1918, to April 30.

The following Flying Officers relinquish their temp. R.A.F. commissions on return to Army duty:—G. W. Panter, M.B.E. (Lieut., R.I. Rif.); Oct. 15. G. W. Nelson (Lieut., Gord. Highrs.); Nov. 6. T. H. Holmes (Lieut., R.F.A.); Nov. 15. (Hon. Flight-Lieut.) C. H. Markham (Capt., North'd. Fus.); Nov. 19.

(Then follow the names of 18 officers who are transf'd. to the Unemployed List under various dates.)

The following Sec. Lieuts. relinquish their commissions on account of ill-health, and are permitted to retain their rank:—B. W. A. Ordish, G. R. Smith (contracted on active service); Nov. 26. G. N. Wood; Dec. 7, 1918 (substituted for notification in the *Gazette* of Aug. 6, 1918).

The notification in the *Gazette* of March 11 concerning Lieut. N. H. Kemp is cancelled.

The notification in the *Gazettes* of July 9, 1918, and Dec. 24, 1918, concerning Sec. Lieut. (Hon. Capt.) F. Grave are cancelled.

## Technical Branch

F. Grave (Capt. and Qrmr., Ldn. R., T.F.) is granted a temp. commission as Capt., Grade (B); April 1, 1918, without the pay and allowances of that rank prior to May 22, 1918.

Flying Officer J. L. Denman to be Flying Officer from (S.O.); Oct. 18 (substituted for notification in the *Gazette* of Nov. 21).

Lieut. W. L. Head to be Lieut., Grade (B.), from ("A. and S."); Aug. 9 (substituted for notification in the *Gazette* of Aug. 30, 1918).

**Second Lieutenants to be Lieutenants.**—S. A. Alder; April 2, 1918, without the pay and allowances of that rank prior to Aug. 28, 1918. V. P. Pereth; June 3. F. Downer; June 6.

**Pilot Officers to be Flying Officers.**—A. D. Edwards; Aug. 5. E. W. Dawson, A. E. Faver, J. H. J. Footman, L. J. Lester, R. Smith; Oct. 1.

Pilot Officer (actg. Flight Lieut.) A. Jukes relinquishes the actg. rank

of Flight-Lieut. on ceasing to be employed as Flight-Lieut., from (S.O.); Oct. 18.

Flying Officer G. P. N. Hardy (Lieut., R.G.A.) relinquishes his temp. R.A.F. commission on return to Army duty; Nov. 17.

(Then follow the names of 16 officers who are transf'd. to the Unemployed List under various dates.)

Lieut. H. J. Murphy relinquishes his commission on account of ill-health contracted on active service, and is granted the rank of Capt.; Nov. 26.

The initials of Sec. Lieut. H. Jacques are as now described, and not "U.," as stated in the *Gazette* of Nov. 18.

The notification in the *Gazettes* of Feb. 11, March 18, May 20, concerning Lieut. (Hon. Capt.) F. Grave are cancelled.

## Medical Branch

(One officer transf'd. to the Unemployed List.)

Capt. H. N. Wright relinquishes his commission on account of ill-health contracted on active service, and is permitted to retain his rank; Nov. 25.

The initials of Capt. A. Moir-Gray are as now described, and not "Q.," as stated in the *Gazette* of Nov. 14.

## Memoranda

**Pilot Officers to be Flying Officers.**—G. H. Brown, W. J. Ryder; Oct. 1.

The following Prob. Flight Officers are granted hon. commissions as Sec. Lieuts.:—B. C. Oades; Nov. 16, 1918. E. F. Northey; Dec. 17, 1918.

C. W. D. Outred; Jan. 23. R. E. Haswell; Jan. 24. R. H. Hardman; Feb. 12. J. G. Heriot; Feb. 13. C. L. Harrison; Feb. 19. C. Norris; March 5. C. L. Mart; March 7. H. E. Mock; March 9. H. W. Merrill; March 18. H. S. McLeod; March 19. J. J. Hartnett; April 2. D. B. Mineard; April 6. R. S. Harrison; April 8. T. E. Hall; April 12. S. B. McBlain; April 14. H. H. Mullens; April 28. C. Moody; May 2. L. G. Hicks; July 24. D. H. O. Oakley; Sept. 26.

(Then follow the names of 11 Cadets granted hon. commissions as Sec. Lieuts.)

Wing Comdr. M. G. Christie, C.M.G., D.S.O., M.C., is placed on the half-pay list; Dec. 3.

Lieut.-Col. (actg. Col.) B. H. O. Armstrong, C.M.G. (Maj. (Lt.-Lieut.-Col.), R.E.), relinquishes his commission on ceasing to be employed; Nov. 15.

The following temp. hon. Lieuts. relinquish their commission on ceasing to be employed:—R. Richardson, H. J. Wilkins; Sept. 16.

(Then follow the names of two officers transf'd. to the Unemployed List.)

## London Gazette, December 5

The following officers have been granted short service commissions, in the ranks stated, with effect from December 5. They will retain their seniority in the substantive rank last held by them prior to the grant of the short service commission.

In the case of officers now gazetted Flying Officer or Observer Officer, from Pilot Officer, seniority will date from the date of the *Gazette*.

**Squadron Leader.**—J. P. C. Sewell, O.B.E. (A.), M. E. A. Wright, A.F.C. (A.P.) (T.).

**Flight Lieutenants.**—A. H. S. Baker, O.B.E. (S.O.), J. S. Browne (A.), B. C. Meates (A.), H. I. Hughes (T.), C. Musgrave, A.F.C. (A.), P. W. Snell, A.F.C. (A.).

**Flying Officers.**—F. P. Adams (A.), C. Ayling (A.), Rev. R. M. Bankes-Jones (A.), C. E. Barraclough (A.), C. O. Bird (A.), S. W. Bird (A.), G. Birkett (A.), H. Bligh (A.), V. A. Boule (A.), W. J. Brown (A.), F. Carpenter (A.), P. J. Cox (A.), W. J. Daddo-Langlois (A. and S.), A. B. M. Dale (T.), F. G. C. Dickinson (A.), B. A. de Nevers (A.), J. MacG. Fairweather (A.), F. A. Giles (A.), A. V. H. Gompertz (A.), W. I. Hannon (A.), F. H. R. Henwood, D.F.C. (A.), R. J. B. Holland (A.), F. L. Hopps, A.F.C. (A.), W. R. S. Humphreys (T.), J. B. Jaques, M.C. (A.), A. R. Jones (A.), K. F. Jones (A.), R. Lamb (A.), R. Littlejohn (Ad.), E. R. Longhurst (A.), R. F. C. Metcalfe (A.), S. E. Mailer, A.F.C. (A.), L. G. Paget, A.F.C. (A.), L. W. Park (Ad.), R. C. Preston, A.F.C. (A.), W. C. Pruden (A.), G. Robinson, M.C. (A.), J. A. Rudd (A.), W. W. Saunders (A.), J. A. H. Savage (S.O.), C. H. Tancred, M.B.E. (S.O.), C. H. Teagle (A.), T. A. Thornton (A.), F. D. Travers, D.F.C. (A.), S. F. A. Welsh (Ad.), H. J. Young, M.B.E. (Ad.).

**Observer Officers.**—J. C. Bulteel, B. E. Essex, A. P. Ledger, M. J. Wyatt, M.C.

**Flying Officers (from Pilot Officers).**—E. H. Attwood (A.), P. Bailey (A.), C. H. Billings (A.), E. Bird (A.), A. D. L. Carroll (A.), W. J. Cooke (A. and S.), G. C. W. Duffy (A.), J. Duminy (A.), J. Edmunds (A. and S.), C. C. Gissing (T.), V. W. Helps (A. and S.), H. S. Hobby, M.C. (A.), E. R. C. Hobson (A.), H. W. Iles (A.), D. M. I. Macarthur (A.), H. N. V. Le V. Noel (A.), W. H. L. Oxlard (A.), S. H. Potter (A.), R. C. Pretty (A. and S.), H. C. Price (A.), C. O. Riden (A.), J. H. Shaw (A.), J. Silvester (A.), M. F. Tomkins (T.), G. M. Trundle (A.), E. A. Turnbull (T.), G. W. Wilson (A.).

**Observer Officers (from Pilot Officers).**—W. A. Armstrong, E. D. Barnes, F. H. Bugge, B. C. S. Byrne, R. T. Carter, G. S. Coggan, B. G. Drake, K. H. Holley, L. W. Kitt, T. L. Lowe.

The notifications appearing in the *London Gazettes* of the dates indicated below, appointing the following officers to short service commissions, are cancelled:—Flight-Lieut. N. R. Cook, D.S.C. (A. and S.); Flying Officer G. J. Fowler, A.F.C. (A.); Oct. 24. D. S. C. Macaskie (T.); Nov. 11.

The notification in the *Gazette* of Nov. 28 relative to Flight-Lieut. E. F. Turner (T.) is cancelled, and that in the *Gazette* of Oct. 24, appointing this officer to a short service commission stands.

## Royal Air Force

The heading of the list of promotions which appeared in the *London Gazette* dated Nov. 28 should read "permanent and short service commissions, and re-seconded officers" instead of "permanent commissions."

Flying Officer W. B. Thomson (A.) is granted a permanent commission in the rank stated; Aug. 1.

The notification in the *Gazette* of Aug. 1 appointing the following officers to permanent commissions is cancelled:—Capt. E. E. N. Burney, M.C. (A.), Capt. L. M. Lilley, O.B.E. (T.), Lieut. M. Minter (A.), Lieut. G. R. Barry (T.), Lieut. D. N. Thompson, M.C. (S.O.).

The notification in the *Gazette* dated Oct. 28 appointing the following officers to permanent commissions, is cancelled:—Flight-Lieut. M. R. N. Jennings, M.C., A.F.C. (A.), Flight-Lieut. A. B. Shearer (A.), Flying Officer C. O. B. Beale, D.S.O. (A.).

The initials of Lieut. R. H. F. S. de V. Somerset are as now described, and not as stated in *Gazettes* of Aug. 1 and Sept. 16.

The following temporary appointments are made at the Air Ministry:—**Staff Officers, 3rd Class (T.).**—Flight-Lieut. L. D. McKean; Nov. 13. (Q.).—Flying Officer H. J. Birtles; Nov. 24.



The following temporary appointments are made:—Group Capt. H. C. T. Dowding, C.M.G., is graded for purposes of pay and allowances as an Area Comdr., whilst officiating in cmd. of an area (from Sept. 1 to Oct. 17).  
*Staff Officer, 1st Class.*—(Air).—Wing Comdr. C. W. Wilson, M.C.; Oct. 16.  
*Staff Officers, 2nd Class.*—(P.).—Sqn. Ldr. H. A. Michell, O.B.E.; Oct. 16 from (S.O.) 1st Class (Air).—Sqn. Ldr. R. L. G. Marix, D.S.O.; Nov. 12.

#### Flying Branch

Wing Comdr. W. F. MacNeece, D.S.O., D.F.C., to be Wing Comdr. (A.), from (S.O.); Dec. 4.

Sec. Lieut. E. Phillips to be Lieut.; Nov. 10, 1918.

The following relinquish the temp. R.A.F. comms. on return to Army duty:—Pilot Officer (Hon. Flying Officer) A. J. Cyr (Lieut., Can. Forestry Corps); May 9. Flight-Lieut. (Hon. Sqn. Ldr.) G. Disney (Maj., Essex R.); Oct. 27. Flight-Lieut. C. C. Clark (Lieut., R.F.A.); Nov. 10. Flying Officer J. K. Smith (Lieut., Lanc. Fus.); Nov. 12. Flying Officer V. Bayley (Lieut., L'pool R.); Nov. 14. Flying Officer W. F. Nickolay (Lieut., E. Yorks. R.); Nov. 17. Flying Officer L. Gellatly (Lieut., Gord. Highrs.); Nov. 20. Wing Comdr. G. E. Todd, O.B.E. (Maj. (Bt. Lieut.-Col.), Welsh R.); Nov. 27.

Sec. Lieut. J. E. M. Phillips relinquishes his commn. on ceasing to be employed; Oct. 25.

Sec. Lieut. H. A. Ball, M.M. (Lieut., R.H. and R.F.A.), relinquishes his temp. R.A.F. commn. on retirement from the Army; Nov. 23.

(Then follow the names of 80 officers who are transfd. to the Unemployed List under various dates.)

The following Lieuts. relinquish their comms. on account of ill-health and are permitted to retain their rank:—F. K. Ratcliffe (contracted on active service); Nov. 27. P. W. Anderson (caused by wounds), A. D. Robertson (contracted on active service); Nov. 28.

Sec. Lieut. E. M. Nicholas relinquishes his commn. on account of ill-health contracted on active service, and is permitted to retain his rank; May 8.

Sec. Lieut. S. Le Roy Switzer is antedated in his appointment as Sec. Lieut. (A. and S.); May 25, 1918.

The notification in *Gazette* Sept. 5 concerning Lieut. F. G. M. Sparks, is cancelled (notification in *Gazette* June 6 to stand).

The notification in *Gazette* Oct. 17 concerning Lieut. H. W. Auerbach is cancelled (notification in *Gazette* Oct. 28 to stand).

The notification in *Gazette* Nov. 4 concerning Lieut. J. N. Catling is cancelled.

The notification in *Gazette* Nov. 18 concerning Sec. Lieut. (Hon. Lieut.) A. Cox (Lieut., R. Welsh Fus.) is cancelled.

#### Administrative Branch

Sec. Lieut. J. A. McGilley to be Lieut.; March 1.

The following relinquish their temp. R.A.F. comms. on return to Army duty:—Flying Officer Sir H. W. A. Ripley, Bt. (Lieut., 1st Drngs.); Feb. 17 (substituted for notification in *Gazette* Feb. 7). Flying Officer C. C. Statt (Lieut., Oxf. and Bucks. L.I.); April 15. Sqn. Ldr. K. L. Buist (Maj., H.L.I.), Flying Officer J. E. G. O'Byrne (Lieut., R. Muns. Fus.); Nov. 19.

Lieut. T. J. Hudson (Sec. Lieut., Ex. Reg. Empd. List) relinquishes his temp. R.A.F. commn. on retirement from the Army; Dec. 6.

(Then follow the names of 25 officers who are transfd. to the Unemployed List under various dates.)

#### Technical Branch

Pilot Officer F. Simpson to be Flying Officer, without the pay and allowances of that rank; Oct. 1 (substituted for notification in the *Gazette* of July 29).

The following relinquish their temp. R.A.F. comms. on return to Army duty:—Flying Officer E. Gayton (Lieut., R.F.A.); Nov. 15. Pilot Officer (Hon. Flying Officer) W. W. Smith, M.C. (Lieut., actg. Capt., Shrops. L.I.); Nov. 18. Flying Officer (Lieut., N. Staff. R.) P. S. Loughton; Nov. 20.

(Then follow the names of 24 officers who are transfd. to the Unemployed List under various dates.)

The notification in the *Gazette* of July 18 concerning Maj. G. Dixon-Spain, M.C., is cancelled. (Notification in *Gazette* of June 27 to stand.)

The notification in the *Gazette* of Oct. 28 concerning Lieut. J. Butterfield, wherein this officer was shown on the Unemployed List, is cancelled. (Notification in *Gazette* of Nov. 7 to stand.)

#### Memoranda.

Lieut. W. F. Kisbey is granted the hon. rank of Capt.; Feb. 19.

Temp. Hon. Lieut. A. R. Densley relinquishes his commn. on ceasing to be employed; May 31.

(One officer transfd. to the Unemployed List.)

The notification in the *Gazette* of Aug. 8 concerning Capt. H. F. Atkinson-Clarke, M.V.O., O.B.E. (Scots Guards) is cancelled.

## AVIATION IN PARLIAMENT

### The R.A.F. Boulogne Depot

CAPT. TERRELL, in the House of Commons on December 2, asked the Secretary of State for War what transport still is maintained at the port depot of the Royal Air Force at Boulogne; what work is done by the lorries; how many officers and other ranks are there still employed; and whether there is any other reason for this depot being kept open except that it forms a convenient booking-office for officers going East by way of Paris?

Capt. Guest (Joint Parliamentary Secretary to the Treasury): I have been asked to answer this question. The reply to the first part is that the mechanical transport at the port depot of the Royal Air Force at Boulogne consists of one touring car and one light tender; to the second part, that there are no lorries; to the third part, that the staff consists of one officer and four airmen; and to the fourth part, that this depot is being kept open to deal with the drafts of airmen arriving from England daily and with the evacuation of airmen from France.

Capt. Terrell: Will this depot be closed down?

Capt. Guest: As soon as it has served its purpose.

### Paris-London Civilian Air Service

LIEUT.-COL. GUINNESS asked the Secretary of State for War whether there are at present any facilities for the repair of British aeroplanes or the supply of spare parts in connection with the daily Paris-London air service at any aerodrome in France except the terminus at Le Bourget?

Capt. Guest: I have been asked to take this question, the reply to which is in the negative. Certain emergency landing-grounds exist between Gris Nez and Le Bourget. The importance of establishing a civil aerodrome with full facilities in the vicinity of Gris Nez is known to the French authorities, and it is understood that they intend to provide such an aerodrome.

Lieut.-Col. Guinness: Is it not a matter for the British authorities? Is the hon. gentleman aware that there are now three different British types of machine flying this route of 130 miles over French ground, and is it not obviously impossible for these companies to provide the necessary facilities for small adjustments before crossing the Channel?

Capt. Guest: This question is complicated by the fact that we are dealing with a civilian service and not a military service, but the Department is in communication with the French authorities on the subject.

Lieut.-Col. Guinness: May we be told when we shall have an Under-Secretary able to answer for the civilian service?

### Royal Air Force

MAJ. STEEL asked the Secretary of State for War whether he can make any statement as to what will be the constitution and strength of the Air Force in the year 1920?

Earl Winterton asked the Secretary of State for War whether he can make any statement as to what will be the constitution and strength of the Air Force between the years 1920, 1921 and 1922?

Mr. Churchill: I propose at an early date to lay before the House a Memorandum by the Chief of the Air Staff showing the proposed strength and composition of the Royal Air Force for the next few years.

Mr. Pemberton Billing: Will an opportunity for debate be given?

Mr. Churchill: Opportunities for debate are fixed in the regular course of the Parliamentary Session and do not arise in consequence of any announcement of this kind. I propose to give a very full and clear indication of the whole of the changes in the air service.

Lieut.-Com. Kenworthy: During this Session?

Mr. Billing: Is it proposed to appoint a new Minister or anyone to answer for the air service?

Mr. Speaker: That does not arise out of the question.

### Wireless Communication (London and Paris)

LIEUT.-COL. GUINNESS asked the Secretary of State for War whether, owing to the interruptions caused by the Eiffel Tower wireless station, messages in connection with the London-Paris air-mail service can be received by the wireless installation at the Paris terminus at Le Bourget; and whether in view of the importance of reports as to British and Channel weather conditions being received before the departure of the mail service, he is taking any steps to make arrangements with the Eiffel Tower station?

Capt. Guest: I have been asked to reply to this question. Routine times of transmission from London to Le Bourget have been arranged so as to avoid the interference referred to by my hon. and gallant friend. In cases when it

is doubtful if the message has been received by Le Bourget, a second message is always sent; during the last week these messages have been received regularly, and no repetition has been required. Air route reports of the British and Channel weather conditions are sent from London to Le Bourget between 8 a.m. and 3 p.m.

Lieut.-Col. Guinness: Has an arrangement actually been made with the Eiffel Tower Co., and is the hon. and gallant gentleman aware that last week these messages were not getting through because, by mistake or misunderstanding, they were regularly jammed by the Eiffel Tower station?

Capt. Guest: I am informed this afternoon that an arrangement or a special allowance of time has been made in regard to the Eiffel Tower station.

### London-Paris Air-Mail Service

LIEUT.-COL. GUINNESS, on December 3, asked the Postmaster-General whether instructions have been given at the post office in Parliament Street that letters for the London-Paris air-mail service are only to be accepted for posting in the morning; what is the reason for preventing the posting of such correspondence daily at the end of business hours; and whether he will now arrange for its acceptance at any time of the day at the eight post offices mentioned in the original announcement?

The Assistant Postmaster-General (Mr. Pease): No instructions have been given for the refusal of aeroplane letters tendered at the Parliament Street branch office in the evening for despatch by the air-mail service to Paris on the following day; and steps have been taken to prevent the refusal of such letters at any of the eight London offices at which correspondence may be posted for transmission by the air-mail service.

### R.A.F. and Kenley Common

SIR ALBION RICHARDSON asked the Secretary of State for War whether the military authorities are still in possession of Kenley Common, which was taken over during the War for military purposes; if so, when it is proposed to vacate the common and to restore to the public their right to the full use of the same; and what is the reason for the delay in so doing?

Mr. Churchill: The answer to the first part of this question is in the affirmative; and to the second and third parts, that owing to the importance of this aerodrome both from a service and civil point of view it is desired to retain it as a permanent station. Negotiations are in progress with this end in view.

### Aerial Route, Egypt and the East

LIEUT.-COL. MALONE on December 4 asked the Secretary of State for War whether it is intended that the aerial route to Egypt and the East should pass *via* Malta?

Mr. Churchill: No decision has yet been arrived at in regard to this.

### Air Ministry Staff

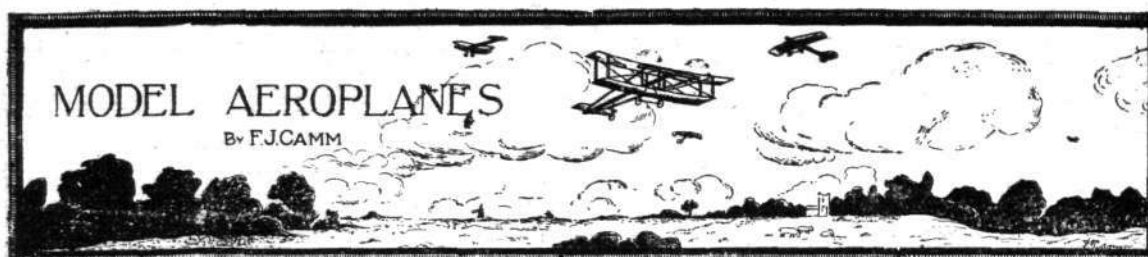
LIEUT.-COM. KENWORTHY asked the Secretary of State for War what is the present staff of the Air Ministry; and how many of these are employed in connection with civil, naval and military aviation, respectively?

Mr. Churchill: The staff of the Air Ministry at the end of November last numbered 2,539. This figure includes the staff recently taken over from other Departments in connection with the transfer of airship work and of the Meteorological Department to the Air Ministry, namely, 136 and 130 respectively. I am unable to supply the statement asked for by the hon. and gallant gentleman in the second part of his question, as it is impracticable to separate the staff into groups employed respectively in connection with civil, naval and military aviation.

### R.A.F. Officers

SIR BERTRAM FALLE asked the Secretary to the Admiralty what gratuity or pension is given to petty officers promoted warrant officers after eight years' service and automatically promoted to Sec. Lieuts., Royal Air Force, on amalgamation of the Royal Naval Air Service and Royal Air Force; and if such officers, demobilised at their own request and in receipt of the permanent officers gratuity, receive the difference between that gratuity and the gratuity given a temporary officer?

Mr. Churchill: The whole question of the gratuities or pensions to be paid to Royal Air Force officers (temporary and permanent) who when commissioned in the Air Force were serving as warrant officers, Royal Navy, or Royal Naval Air Service, has been under consideration for some time, and it is anticipated that a final decision will be announced shortly.



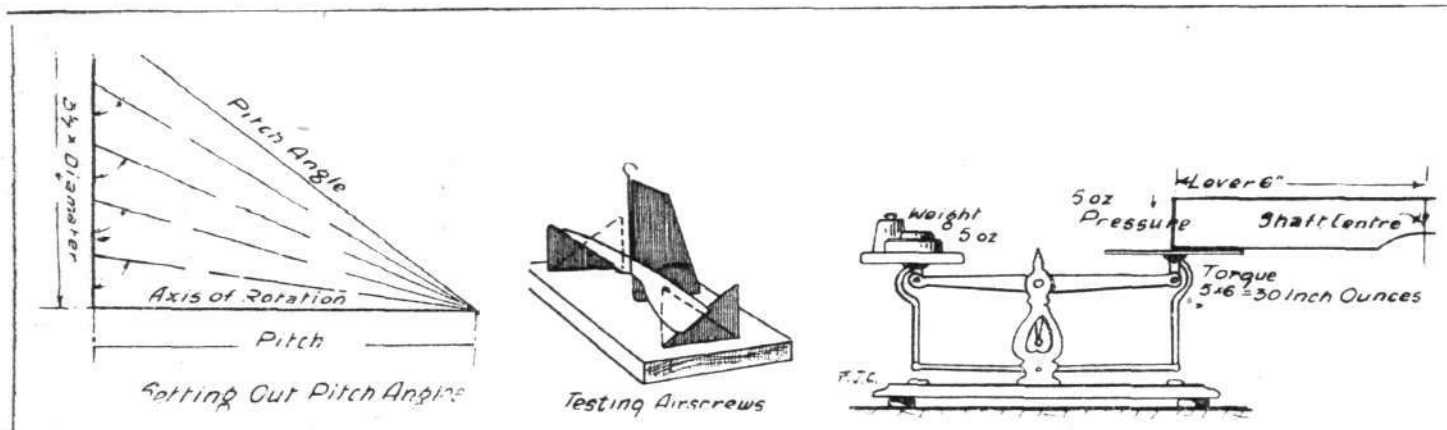
NOTE.—All communications should be addressed to the Model Editor.

## Duration

DURATION contests evoke more interest than distance competitions, the latter being purely a matter of adopting a high loading per square foot and using screws of short diameter and long pitch with a superabundance of rubber driving them. I am probably correct in asseverating that many of the results at present on record have been achieved by uncertain methods, rather than by a carefully propounded scheme with which to attack the problem in hand. As

## Pitch

The pitch of an airscrew is (for carved screws) the product of the thickness of the block and  $3\frac{1}{2}$  times its width inverted. With bentwood airscrews it is necessary to measure the angle the tip makes with the axis, and multiplying the tangent of the angle so found by the length of the circumference of the disc swept by the screw. If, therefore, the angle of the tip is  $30^\circ$ , the corresponding tangent will be .57 approximately. Assuming the diameter of the airscrew to be 12 ins.



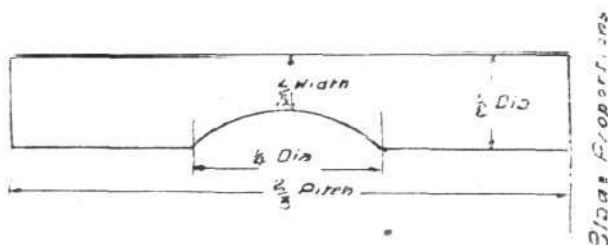
in most other branches of science, so in model aeroplaning the theorist and practician are loud in their declamations of one another; in reality the two are inseparably interwoven. I have often demonstrated the difference in the results of haphazard and certain methods. So many are satisfied with the attainment of flight of their models that little thought seems to be given to the other side—the underlying principles.

Loading.	Speed in ft. per sec.	Loading.	Speed in ft. per sec.
3 ..	15.2	6 ..	21.6
4 ..	17.6	7 ..	23.3
5 ..	19.7	8 ..	24.9

With duration the loading per square foot bears a definite relation to the pitch of the screw or screws; for suppose the loading is 6.02 per sq. ft. (about  $4\frac{1}{2}$  is ideal for duration), there is a corresponding air speed at which a model so loaded will fly most efficiently and with a minimum amount of power, in this case 14.7 miles per hour or 21.6 ft. per sec.

## Airscrews

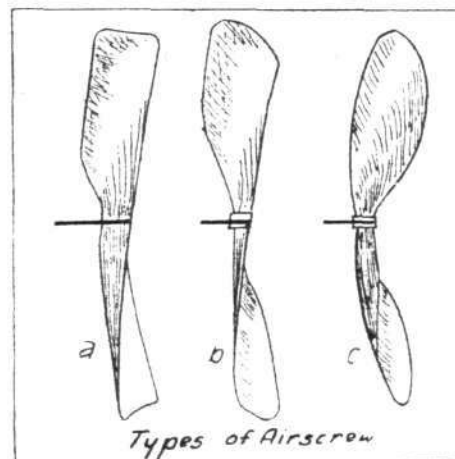
It is easy to observe that the pitch of the airscrews, multiplied by their revolutions per second, should equal this distance. If screws are used which fall short of this distance, the model cannot be expected to put up a good performance.



For this reason it is the better plan to complete the model minus the screws (allowing an ounce or so for their weight), and to carefully check the loading. From the appended table its speed in ft. per sec. can be ascertained, taking an average of the two nearest loadings (higher and lower) when it falls between the loadings given. Assume the loading is  $6\frac{1}{2}$  ozs. per sq. ft. By looking up the table it is found that this corresponds to a speed of 22 ft per sec. This constitutes the product of the pitch and the revs. per sec.

the circumference of the disc swept by it will be  $3\frac{1}{2} \times 12 = 37.42$ . Multiplying this by the tangent .57 we obtain 22.32 ins. as the pitch of the screw.

Much controversy has ranged round the question of the comparative efficiency of carved and bentwood screws.



Personally I am of the opinion that carved screws are some times less efficient than bentwood ones, if made by guessing some symmetrical shape and carving to it. It is well known that an efficient screw delivers as nearly as possible a cylinder of air, not a tube; in other words, it drives air back at a constant velocity along its entire length. With an inefficient screw some portions of the blade act as a drag on the others, owing to the difference in the velocities of the volumes of air driven back by each portion. Now, in order to eliminate this waste of power, and to ensure that the screw absorbs a maximum of the torque imparted to it by the shaft, it follows that the pitch angles along the blade must be so graduated that the pitch is constant along its entire length. A moment's thought will show that this must be, because the surface speed at half the screw-radius from the centre is only half that of the tip; hence the angle at this point must be double that of the screw-tip. (It is well to note, in parenthesis, that with full-size screws a small increase on this is allowed to correct discrepancies.)



### Setting Out Pitch Angles

These angles may be found (as shown in Fig. 1) by erecting a line equal in length to the circumference of the disc swept by the airscrew and another equal to the pitch. By subdividing this peripheral line as shown, the angle at the corresponding points of the blade are found. The angle at any point of the blade can be found in this manner. The drawing should, of course, be made to some convenient scale.

The angles may be checked by the simple apparatus shown in Fig. 2, cutting cardboard or tin templates to the angles obtained by the method shown in Fig. 1, and erecting them at that distance from the centre to which they vie in the airscrew blade. In the light of this information it is absurd to imagine that a carved screw (if made without resorting to this method) should be more efficient than a bentwood. It is these angles which determine the shape of the screw; the varying cross sections of the block necessary to ensure the variation of the pitch angle deciding exactly the position of the curved edge in relation to the parallel edges of the block from which the screw is being carved. If the reader makes a comparative test by carving two screws of similar diameters from two blocks of equal dimensions (in one instance adopting the method outlined, and in the other, resorting to guesswork), and then tries them on a model, he will be astonished at the difference in the power required to achieve the same result. For example, it may take 1,000 turns on a 3 ft. 6-strand motor to obtain 60 secs. duration with the incorrect screw, whereas the correct one may only take 800 turns on a 5-skein motor of the same length. Expressed in a more certain way, one may take 30 inch ounces of torque, and the other only 25 inch ounces.

### Measuring Torque

Torque may be computed, as shown in Fig. 3, by winding the screw and letting its tip rest on the centre of an accurate balance-pan. The pressure is balanced in the counterpoise pan by means of small weights; and torque is the product of the screw radius and the weight which just balances the pressure from the screw—in the example shown, 30 inch ounces. The thrust itself is the product of the weight of the mass of air driven back in one second by the screw and the speed (in ft. per sec.) at which the mass is moved; the speed, of course, is determined by multiplying the pitch by the revolutions per second of the screw.

It is generally accepted that better results are obtainable from screws having large diameter and moderate pitch (about  $1\frac{1}{2}$  times the diameter) than with screws of short diameter and long pitch—this applying to both bentwood and carved screws. I do not consider it advisable to exceed



### "British Airships"

THERE are singularly few books in English on the subject of airships, and for that fact alone the volume by Major George Whale, late of the R.A.F., is welcome. In the opening chapter Major Whale summarises in simple language the chief principles of design and the methods adopted in operating airships. He then goes on to trace the history and development of airships in England and on the Continent previous to and during the War, giving brief descriptions of the characteristic types which were evolved from time to time and outlining the results obtained and some reasons which lead to the improvement of subsequent vessels. His book is therefore one for the general reader rather than for the technical student. At the same time it will doubtless be found useful by those who are considering the possibility of utilising airships in any way, for it shows what has been done and what is possible with the various types of motor-driven lighter-than-air craft. In the concluding chapter Major Whale, discussing the future of airships, gives some figures regarding the load capacity of some of the latest types of rigid, such as the L70, R33 and R38, and indicates what may be accomplished with airships of even larger displacement. Major Whale thinks that a small airship of the S.S. Zero type would appeal to many sportsmen who have hitherto sought their amusement and recreation in yachting, motoring or ballooning. He also points out the possibilities of utilising airships for such purposes as exploring the unmapped regions of the Amazon, searching for pearl-oyster beds, sponges, coral, etc., locating icebergs in the Northern Atlantic, policing deserts such as those in Arabia and the Soudan.

The book is illustrated by about a score of photographs of typical British airships, but we think that in future editions the selection of photographs could be added to with advantage, bearing in mind that there is no illustration in the book of the latest British rigid, such as the R33 or R34. The book is published by Mr. John Lane, and the price is 7s. 6d. net.

45° pitch angle, when the pitch exactly equals the circumference of the circle described by the screw; the latter commences to lose efficiency once this angle is exceeded. In this latter respect the airscrew bears out the "critical-angle" theory of aerofoils which fixes a set angle of incidence, for a given section, at which the aerofoil will give a maximum lift.

(To be continued.)

### Bentwood Screws

With regard to bentwood screws, I have obtained the best results with screws made to the proportions given by Fig. 4. Some of the types much in vogue of late are shown in Fig. 5; it is not thought that much is to be gained by imparting freak shapes to the contour of the blades. The type given by *a* is my own type, and, of *b* and *c*, *b* is the most efficient. A pair of 12-ins. screws recently made by the writer (and with which the duration mentioned in the previous issue was made) weighed  $7\frac{5}{8}$  ozs. the pair!

### Competitions

With regard to my note last week, I wish to arrange a competition (the rules and prizes for which to be announced subsequently) in which provincial aeromodellists may compete. I should be glad to hear from any interested provincial readers, as well as from the London clubs. The only difficulty seems to be that of authenticating the flights, but doubtless this could be got over. I should like readers to indicate their views with regard to the rules of the competition, in order that some working basis may be decided on.

### Illinois Model Aero Club

The results recently to hand of the above club portends some surprising results next spring from America. W. D. Pease created a record for America of 133 secs. in the competition for the Laura Weaver Trophy, which is awarded each year to the member putting up the best average performance. It cannot be said that America previously encouraged model aviation, and it is interesting to note the progress the numerous clubs now formed there. Many of them possess members drawn from the English clubs, probably the most enthusiastic being Mr. W. P. Dean, previously of the Manchester club, and connected with model aviation even prior to the time of Blériot's Channel crossing in 1909.

### Replies to Correspondents

H. S. and H. B. (Leicester).—Many thanks for your conjoint letter. We replied direct to your queries. Why not form a club in Leicester yourselves? The model you mention did within a second or so the same performance in four consecutive flights in damp weather; no sun, and a wind! Hardly a matter of luck?

### "Cattewater Old Boys"

EX-OFFICERS and men who were stationed at the Sea-plane Station, Cattewater, Plymouth, during the War, at a meeting at the Holborn Town Hall, on December 3, decided to form a club, to be called the "Cattewater Old Boys." Capt. A. T. Sketchley was elected President, and Mr. Boshier, Secretary, while the Committee consists of Messrs. Kalber, Murphy, Reid, May, Ogle, Mamstree, Balch and Courtneidge. The first dinner will be held in London at the end of January. All members who were at Cattewater during the War are asked to send their names and addresses to Mr. Boshier, 33, Langdon Road, Junction Road, Highgate, N.

### Experiments in Hovering Flight

CAPT. HAMERSLEY, M.C., has been making experiments at Hamble in hovering flight. He took up the Avro "Baby" in a wind of about 40 m.p.h., faced the wind, and throttled down. By nicely calculating the respective strengths of thrust and drift, he succeeded in remaining in the same spot over the aerodrome for about five minutes. The spectators say that it was a very curious sight. At Amsterdam he had allowed the Baby to be blown backwards, and landed on the aerodrome without turning; but he wanted to see whether it was possible to actually hover over a spot for five minutes, and he succeeded.

### Air Raid and Rent

AN action arising out of an air raid on March 8, 1918, was heard at the Bloomsbury County Court on Monday. A bomb fell on a flats building at Hampstead, and as a result of the damage the tenants had to go elsewhere. £13 was claimed for rent from one of them, Mrs. Steele.

Judge Bray told her that she might have an action for damages, and he advised her to consult a solicitor. There was no answer to the claim for rent, and she was ordered to pay £1 a month.

## SIDE-WINDS

It is pretty difficult to make an avowedly advertisement booklet attractive, interesting and informative, but in an illustrated brochure just to hand from Messrs. C. C. Wakefield and Co., this combination of three most excellent qualities has been thoroughly achieved. It serves to indicate how closely the history of Castrol has been interwoven with that of aviation, and its pages are adorned with a large number of portraits of pioneers and pilots who have outstanding performances to their credit. Those who have been responsible for the getting-out of this brochure, which bears on its cover a charming miniature of Lord Leighton's "Daedalus and Icarus," are to be congratulated upon their work, which will doubtless be sought after. Those, therefore, who wish to secure a copy should write at once to the Aviation Department, Messrs. C. C. Wakefield and Co., Wakefield House, Cheapside, E.C. 2.

THE Airco "aerial postmen" who carry the express G.P.O. mail between London and Paris completed on Saturday their fifteenth week of daily flying, having accomplished 184 aerial journeys at an average speed of 104 miles an hour. On the service to Paris Lieut. Bradley, leaving Hounslow at 12.50 p.m. with eight bags of mails, alighted at Lympne to pick up some additional mails and parcels, and arrived at Le Bourget at 3.25 p.m. On the service from Paris to London Lieut. Shaw, with mails and parcels, found visibility so bad as he approached the French coast, that he landed near Abbeville and completed his journey to Hounslow on Sunday, alighting at 4.5 p.m.

THOSE who are going to Paris for the Aero Show should make a note that they will be able to obtain FLIGHT and other English newspapers at Messrs. W. H. Smith and Son's Afternoon Tea and Reading Rooms at 248, Rue de Rivoli, Paris. Both the tea rooms and the reading room were found very useful by the large number of English visitors to the recent Motor Show.

It is impossible to emphasise too strongly the importance of having adequate cooling arrangements on an aeroplane which sets out to fly to Australia. It is interesting to note, therefore, that the Martinsyde machine, which is now making steady progress to the South, is fitted with radiators made by Messrs. Baynes and Partners.

THANKS to the enterprise of the Avro Co., Londoners quickly knew the result of the Carpentier-Beckett fight. It was arranged that as soon as the result was telephoned to Hounslow an Avro should fly over London firing coloured lights to indicate the name of the victor—red for Beckett and green for Carpentier. This programme was successfully carried out. Luckily the night was clear, though the wind was strong, and Maj. A. G. Taylor, A.F.C., the Avro London manager, who was the pilot, had a hard fight against the wind on the journey back. A perfect landing was made after a flight lasting about three-quarters of an hour; practically the whole of London was covered.

MANY old readers of FLIGHT will recall Mr. W. Cecil England, who took his ticket in 1911 and flew a machine in Rangoon the following year. As soon as he could get home he joined up in the R.N.A.S., and later served in the R.A.F. Having been demobilised he has gone back to Burma, but, as will be seen from an announcement elsewhere, he is desirous of retaining his connection with the aeronautical world, and will be pleased to assist any firm who are desirous of obtaining information as to flying conditions in Burma, etc.

"CORRECT LUBRICATION," a 60-page booklet issued by the Vacuum Oil Co., Ltd., is considerably more than a mere statement of the excellence of Gargoyl Mobiloils. It is a real help to motorists, explaining in clear language the imperativeness of scientific lubrication and emphasising the reward of this practice—economy of repairs, of depreciation, and of fuel and oil. Engine and chassis troubles are delineated and their remedies stated, and a lengthy chart, embracing most types of motors, passenger and commercial, British and imported, shows the exact grade of Mobiloil to be used on each. Any one who reads this booklet—an act that involves no mental discomfort—will gain an extension of knowledge that cannot fail to prove profitable.

## IMPORTS AND EXPORTS, 1918-1919.

AEROPLANES, airships, balloons and parts thereof (not shown separately before 1910). For 1910 and 1911 figures see "FLIGHT" for January 25, 1912; for 1912 and 1913, see "FLIGHT" for January 17, 1914; for 1914, see "FLIGHT" for January 15, 1915; for 1915, see "FLIGHT" for January 13, 1916; for 1916, see "FLIGHT" for January 11, 1917; for 1917, see "FLIGHT" for January 24, 1918; and for 1918, see "FLIGHT" for January 16, 1919.

	Imports.		Exports.		Re-Exportation	
	1918.	1919.	1918.	1919.	1918.	1919.
	£	£	£	£	£	£
January ...	49,402	555,989	24,765	57,571	—	—
February ...	51,941	453,822	13,545	57,972	—	—
March ...	47,930	704,424	11,451	72,716	1,000	400
April ...	33,342	97,662	10,815	25,433	—	—
May ...	942,866	136,631	67,224	38,428	—	—
June ...	864,296	1,410	35,658	41,526	—	—
July ...	1,834,293	136,463	10,800	41,290	—	—
August ...	566,137	67,292	71,503	60,581	—	—
September ...	505,160	172,192	8,033	65,349	100	—
October ...	294,835	132,243	9,166	87,635	—	500
November ...	410,557	44,713	75,811	67,831	—	7,200
	5,600,759	2,502,841	338,771	616,332	1,100	8,100

## NEW COMPANIES REGISTERED

AERO AND MOTOR CO., 8, Peter Street, Manchester.—Capital £8,000, in £1 shares. Acquiring business of a motor car dealer carried on by A. D. Scarlett at 8, Peter Street, Manchester, as the "Aero and Motor Co.," etc. First directors: A. D. Scarlett, R. M. Papellian and A. Scarlett.

FIRST ATLANTIC FLIGHT, LTD.—Capital £100, in £1 shares.—Manufacturers of and dealers in aeroplanes and airships, etc. Solicitors, Claremont, Haynes and Co., Vernon House, Cicilian Avenue, Bloomsbury, W.C.

METRIC ENGINES, LTD., 53, Victoria Street, S.W.—Capital, £11,000, in £1 shares. Aeronautical, motor and general engineers, etc. First directors: G. E. Bacher and A. Milner.

## AERONAUTICAL SPECIFICATIONS PUBLISHED

Abbreviations:—cyl. = cylinder; I.C. = internal combustion; m = motors

### APPLIED FOR IN 1918

The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

Published December 11, 1919

- 4,594. F. H. PAGE. Aircraft frame structures. (134,858.)  
8,736. J. ROBINSON. Direction-finding. (134,560.)  
18,332. H. R. RICARDO. Mounting of aircraft propellers. (134,895.)  
18,373. A. BECK and NICHOLSON and SONS. Aeroplane dope. (134,899.)  
18,464. SOC. ANON. DES ETAB. L. BLERIOT. Regulating devices for use in electrical machinery. (130,575.)  
18,558. G. H. ABELL and J. S. WHEELWRIGHT. Apparatus for obtaining sea-water for ballast on airships in flight. (134,921.)  
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20,766. H. LEITNER. Metal aircraft propellers. (135,006.)

If you require anything pertaining to aviation, study "FLIGHT's" Buyers' Guide and Trade Directory, which appears in our advertisement pages each week (see pages xxxv, xxxvi, xxxvii and xxxviii).

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